BOTANIC GARDENS OF SYDNEY

Cunninghamia

A journal of plant ecology for eastern Australia

ISSN 2200 – 405X (Online)

Fern grottoes of the Southern Highlands, New South Wales: important habitat for fern diversity and rare species

Kevin Mills

12 Hyam Place, Jamberoo, NSW, 2533 AUSTRALIA.
email: kevinmillskma@gmail.com

Abstract: The Polypodiopsida (Pteridophyte) flora of the Southern Highlands of New South Wales was investigated and found to be diverse and abundant, reflecting the effects of a relatively high altitude (>400 m) and rainfall (>1000 mm), along with a variable geology. A total of 2,881 records of 91 species was recorded at 138 sites during field surveys and includes 174 records of 26 rare and range-restricted species. The 99 species recorded for the Highlands represents about 52 % of the State's ferns and fern allies.

The results provide an indication of the relative abundance of each species in the Highlands and highlight the conservation importance of some species in a State-wide context. The Southern Highlands is identified as one of the key areas in the State for the conservation of several species of fern that are restricted to moderately high altitude rainforest. The results also point to the need for assessing some species for listing as threatened. The information provided on the Polypodiopsida flora and associated important habitats will assist in land use management decisions.

Mills K (2024)
Fern grottoes of the Southern Highlands, New South Wales: important habitat for fern diversity and rare species.
***Cunninghamia* 24: 001–008.**
doi: 10.7751/cunninghamia.2024.001

Accepted: 24 January 2024
Published: 17 April 2024

© 2024 The Author(s) or their employer(s). Published by Botanic Gardens of Sydney.
This is an open access article distributed under the Creative Commons Attribution-NonCommercial 4.0 International License (CC BY-NC)
OPEN ACCESS

Introduction

> **Grotto** 1. A cave or cavern, especially one which is picturesque or an agreeable retreat. 2. An excavation or structure made to imitate a rocky cave, often adorned with shell-work, etc. Oxford English Dictionary.

The fad for ferns in the Victorian era was so intense that a term was coined for it, *pteridomania*. The craze saw the building of artificial fern grottoes on the estates of the English wealthy. In Australia, tourists were enticed to natural fern grottoes, such as those in the Blue Mountains and in the Bundanoon area on the Southern Highlands.

The Minnamurra Falls on the NSW Illawarra coast has been known for its rich fern flora since the collections of Council's ranger, Howard Judd in the 1950-60s. References to ferns on the sandstone plateaus and basalt uplands on and adjacent to the Southern Highlands are included in a few previous studies, including those in the Robertson rainforest (e.g., Kodela 1990; Mills 2020) and, below the plateau, at Macquarie Pass (Fallding and Benson 1985; Mills 2016b) and Minnamurra Rainforest (Mills 2016a). However, no targeted surveys for ferns have been carried out more broadly across the plateau. This study investigated the Polypodiopsida (Pteridophyte) flora of the higher altitudes of the area known particularly in the tourist industry as the Southern Highlands extending from Macquarie Pass National Park and Barren Grounds Nature Reserve in the east to Bundanoon and Penrose in the west (Figure 1). The area covers the south-eastern corner of the Central Tablelands Botanical Subdivision and is within Wingecarribee and Kiama Local Government Areas.

The region encompasses elevated plateaus, generally between 500 and 750 m above sea level, bounded by the coastal and inland clifflines. In addition to the relatively high altitude, the area is characterised by high rainfall, which largely defines the study area, low winter temperatures and significant geodiversity. The Highlands is one of several elevated regions in eastern New South Wales where ferns proliferate. Rainforest, the Highland's primary fern habitat, exhibits floristic characteristics that reflect the altitude, as does the fern flora, which is diverse and unique in the broader region. For convenience, 'fern' includes true ferns and fern allies.

From field surveys at natural sites distributed throughout the region it has become clear that the region is a highly important area for fern conservation in the State, and many of the species are rare locally and more broadly in New South Wales. The aims of this work are to (i) document the fern flora of the Highlands; (ii) identify the botanically significant species; and (iii) highlight the importance of the region for fern conservation in a National and State context.

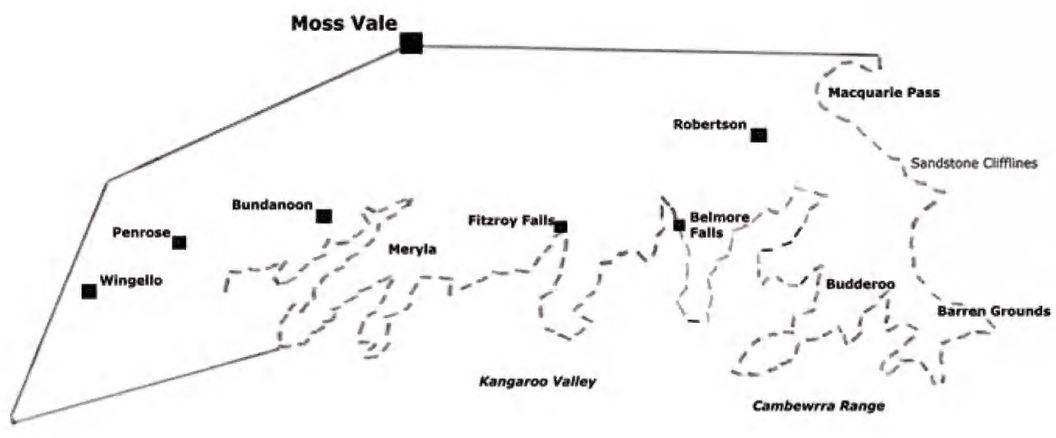


Figure 1. Map of the study area on the Southern Highlands.

Study area

Geology and climate

The base of the Highlands plateau is the Triassic Hawkesbury Sandstone, which is the most southern and highest part of the Nepean Ramp, a structural feature that rises from sea level near Port Hacking to the high country around Robertson. Above the sandstone and covering much of the Highlands, are the Triassic Ashfield Shale, part of the Wianamatta Group of sedimentary rocks, and the overlying Tertiary Robertson Basalt (Robertson 1:50,000 Geological Sheet 9028-IV). High clifflines of Hawkesbury Sandstone are a feature of the eastern and southern edges of the Highlands. Below the sandstone cliffs, various sedimentary rocks of primarily Permian age, ranging from shale to sandstone, and in some places igneous rocks, form the steep slopes below the sandstone cliffs. The Permian Berry Siltstone is extensive in the far south-western corner of the Highlands.

The past climate of the region is characterised by a relatively high rainfall and at times very low temperatures; fog is very common at any time of the year and snow occasionally falls. Rainfall records for the town of Robertson in the east of the Highlands indicate an annual mean rainfall of 1,682 mm (36 years of record), while in the west the figure for Bundanoon (120 years of record) is 1,165.6 mm. To the northwest, away from the escarpments, rainfall is considerably lower; the figure for Moss Vale is an annual mean of 784.5 mm (22 years of record). Mean temperatures at Moss Vale, the only weather station with temperature records, range from 11.9 °C in July to 26.3 °C in January. The mean lowest temperature at Moss Vale is -4.0 °C and recorded for July.

Geography and land tenure

Most of the Highlands is a gently undulating, high altitude plateau, ranging in elevation from around 500 to 700 m. The main drainage systems are the upper Nepean and the Wingecarribee Rivers, which drain inland to the north to northwest. The northern part of the Shoalhaven River catchment covers the southern margins of the plateaus via its tributary the Kangaroo River. Relatively small streams drain the eastern and southern edges of the plateau. These generally flow for short distances before dropping into gorges that incise deep valleys below the plateau, while others fall from sandstone clifflines, producing the many waterfalls that characterise the southern part of the Highlands. A feature of these streams are the small gorges that usually form just above the cliffline; these are often deeply entrenched, very moist and provide a high level of protection from bushfire and solar radiation; these are termed *fern grottoes* here. In some areas, 'upland swamps' occurring on the sandstone landscape yield a year-round flow in these streams, providing near-continual moisture to downstream rainforests. Whilst not part of the Highlands, the adjacent Cambewarra Range, extending along the southern side of Kangaroo Valley west from Barren Grounds, is topped with mesa-like outliers of the Hawkesbury Sandstone and is at a similar altitude to the main plateau to the north; this range is included in this study.

Most of the higher fertility soils derived from basalt and finer-grained sediments are freehold land under rural use and are cleared of native vegetation. In the east and south, the Hawkesbury Sandstone is the surface rock, which largely remains uncleared and is primarily reserved public land. These reserves encompass parts of Macquarie Pass, Budderoo and

Morton National Parks; Barren Grounds Nature Reserve; and Meryla State Forest (mostly gazetted as Meryla Flora Reserve); while Penrose and Wingello State Forests are largely on the underlying Berry Siltstone. The only reserves on the basalt are the tiny Robertson Nature Reserve and a small section of Budderoo National Park. While a few survey sites were available on the basalt soils, most of the survey was restricted to the sandstone landscape and in some cases the immediate slopes below the clifflines.

Methods

This study incorporates many fern surveys undertaken over seven years from 2016-2023. Table 1 shows the various location studies, most are at elevations above 400 m. Most of the surveys were within formally protected conservation areas including national parks and state forests (Mills 2016 – 2023). Land outside these areas is almost totally cleared and in agricultural use; a few sites were located on private land. While most sites are on the plateaus and often extending just below the cliffline, in a few cases the surveys extended to lower altitudes in the cold upper valleys in Kangaroo Valley. The Minnamurra Falls area was not included as it is at a low altitude.

Overall 138 local sites were explored and surveyed. Local sites, while not defined exactly in terms of aerial extent, were usually within a small rainforest gully and the adjacent slopes and gully edges. Some plateau areas that support forest and swamp vegetation were thus included. The sites were determined prior to survey with topographic maps and aerial photographs to identify the sites that supported rainforest, thus maximising the chances of finding fern species. All fern species encountered were recorded, noting any significant species and their habitat. In part, the surveys aimed to confirm historic records, identify the rare species and potentially generate new records of significant species. A photographic record of all species recorded was maintained. Records in the Australasian Virtual Herbarium were used as a guide to the species that may be present, along with the apparent status of the species in New South Wales and in the Highlands based on the number of herbarium collections. Species names follow the Australian Plant Census maintained by the Australian National Botanic Gardens. A summary of the locations and number of sites in each survey area is shown in Table 1.

Habitat descriptions

The characteristic vegetation of the survey sites is warm-cool temperate rainforest (Mills 1986; Mills & Jakeman 1995; Robertson Environment Protection Society 2021). This rainforest occurs mainly in small gorges cut into the edge of the plateau and on the upper slopes below the high sandstone cliffs, which are included in many sites. The small gorges form the *fern grottoes* where the high diversity of ferns is to be found. The Robertson Basalt once supported a considerable area of warm-cool temperate rainforest, known as the Yarrawa Brush (Mills 1986). Little remains of this rainforest, although a few survey sites were located on basalt.

The dominant rainforest tree is almost invariably *Ceratopetalum apetalum*, often with *Doryphora sassafras*. Other prominent trees are *Cryptocarya glaucescens, Eucryphia moorei*, *Polyosma cunninghamii*, *Quintinia sieberi* and *Syzygium smithii*. Additional woody plants include *Coprosma quadrifida*, *Hedycarya angustifolia, Melicytus dentatus, Olearia argophylla*, *Pittosporum multiflorum* and *Tasmannia insipida*. Vines and creepers are often quite common, including *Aphanopetalum resinosum, Celastrus australis*, *Parsonsia brownii* and *Vincetoxicum barbatum*. Common ferns include *Arthropteris tenella*, *Blechnum ambiguum*, *Blechnum wattsii, Sticherus flabellatus, Todea barbara* and several small epiphytes, including *Pyrrosia rupestris*, *Notogrammitis billardierei* and *Hymenophyllum* species. The tree ferns *Cyathea australis* and *Dicksonia antarctica* are often common.

The surrounding sandstone plateaus primarily support forest, woodland and heathland, with extensive upland swamps in some places, such as on the Budderoo Plateau. Plant diversity is generally high, but fern diversity is relatively low in what can be highly exposed and fire-prone landscapes. Common ferns in that environment include *Lindsaea linearis*, *Sticherus* species, *Gleichenia* species and the fern ally *Selaginella uliginosa*.

Figure 2. A small gorge above the escarpment cliffline on the northern side of Kangaroo Valley, typical of the region's fern grottoes and most of the survey sites.

Results

There were 2,881 observations of 87 species of fern and four fern allies from the 138 sites. An additional six species representing historic collections were not located in the current surveys; these are highlighted in Table 2 and Appendix 1. A further two species not encountered are wetland ferns but known to be present on the Highlands. The species found in the Highlands, including historic collections, represent about 52 % of the State's native fern flora and 77 % of the species found in the southeast of the State (Mills 2023a).

Table 1. The number of fern survey sites in this study for various locations on the Southern Highlands.

Survey area	Reference	No. Sites	Altitude range
Bundanoon area, Morton National Park	Mills (2022a)	15	250 m - 640 m
Barren Grounds Nature Reserve	Mills (2021)	20	360 m - 666 m
Budderoo National Park (plateau)	Mills (2022b)	30	430 m - 650 m
Other	Mills (2023b)	13	450 m - 710 m
Morton National Park, northern escarpment	Mills (2022d)	16	460 m - 640 m
Wingello State Forest	Mills (2023b)	10	500 m - 640 m
Meryla State Forest (incl. Flora Reserve)	Mills (2023c)	21	530 m - 650 m
Budderoo NP (Minnamurra R. catchment)	Mills (2016a)	3	600 m - 650 m
Penrose State Forest	Mills (2023b)	8	610 – 680 m
Macquarie Pass National Park	Mills (2016b)	1	650 m
Robertson Nature Reserve	Mills (2020)	1	760 m
All		138	250 m - 760 m

Two distinct fern floras can be recognised; one group is associated with the sandstone plateaus of the Hawkesbury Sandstone, and a second group on finer-grained soils of the Permian sediments and Robertson Basalt and the highly sheltered fern grottoes mentioned above. Appendix 1 lists all 99 species recorded for the Highlands. The number of sites recorded in Appendix 1 provides an indication of the relative abundance of each species in the region.

Fern species that are rare in southeast New South Wales, as identified by the author, are listed in Table 2, which also shows the total number of herbarium specimens for NSW and for the Highlands; these figures were obtained from the online Australasian Virtual Herbarium and include all recent and historic records. The final column indicates the number of sites within the Highlands in which each species was recorded in the current study (i.e., 2016-2023).

Rarity is assessed as a species with few herbarium collections, either in the State or on the Southern Highlands, together with the author's extensive field experience on the NSW South Coast. In Table 2, 26 rare species are listed, 26 % of all species recorded for the Southern Highlands, represented by 174 observations across the 138 sites in this study. Almost all of the species listed in Table 2 are restricted to the Southern Highlands within the broader region (Mills 2023a).

Table 2. Conservation status as determined by the author from records of rare fern species on the Southern Highlands.
* = Listed under the *Environment Protection & Biodiversity Conservation Act 1999* (Commonwealth). # = Briggs & Leigh (1996).

Species	Local Status	Total No. State	Specimens Local	Observations 2016-2023
Abrodictyum caudatum	rare	88	5 (5.7%)	4
Adiantum diaphanum	rare	64	1 (1.5%)	3
Asplenium flaccidum	uncommon	106	6 (5.6%)	15
Asplenium gracillimum	rare	105	3 (2.8%)	4
Blechnum chambersii	historic only (1957)	4	1 (25%)	-
Blechnum gregsonii	historic only (1960, 1994) #	67	2 (3%)	-
Botrychium australe	rare	97	1 (1%)	1
Deparia petersenii ssp. *congrua*	uncommon	78	5 (6.4%)	4
Hiya (Hypolepis) distans	rare *	1	1 (100%)	1
Hymenophyllum bivalve	rare	40	14 (35%)	4
Hymenophyllum lyallii	uncommon #	53	19 (36%)	24
Hymenophyllum marginatum	rare	43	16 (37%)	2
Hymenophyllum peltatum	historic only (1984)	1	1 (100%)	-
Hymenophyllum pumilum	historic only (1890, 1964) #	5	2 (40%)	-
Hymenophyllum rarum	uncommon	34	12 (35%)	10
Lastreopsis munita	historic only (1963)	105	1 (1%)	-
Leptopteris fraseri	uncommon	153	17 (11%)	27
Lindsaea trichomanoides	rare #	23	11 (48%)	14
Phlegmariurus varius	rare	68	2 (3%)	11
Polystichum formosum	rare	52	4 (7.7%)	1

Species	Local Status	Total No. State	Specimens Local	Observations 2016-2023
Pteris comans	rare	44	6 (13%)	3
Rumohra adiantiformis	uncommon	74	5 (6.8%)	17
Sticherus urceolatus	uncommon	55	3 (5.5%)	14
Tmesipteris obliqua	rare	66	2 (3%)	1
Tmesipteris ovata	rare	42	5 (12%)	3
Tmesipteris parva	uncommon	46	3 (6.5%)	11

Figure 3. *Lindsaea trichomanoides*; the Southern Highlands is the stronghold of this species in New South Wales.

Figure 4. The Southern Highlands contain 11 species of filmy fern and is a stronghold for several species, including this species *Hymenophyllum rarum*.

Discussion

This study shows that the Southern Highlands is one of the strongholds for upland ferns in NSW, and indeed Australia. The fern flora is characterised by the high number of species present, 52 % of the State's total, and the concentration of species of State-wide and Regional botanical importance. Of the 99 species recorded for the region, one quarter are identified as being of State or Regional significance, highlighting the significance of the area for fern conservation.

Perhaps the main threat to the fern flora is climate warming, experienced through more frequent and severe drought and associated bushfire; both likely to worsen in future. The generally very wet habitats, the small gorges where the high diversity fern grottoes are to be found, are not immune from these impacts, as the fires that burnt the deep rainforest-filled valleys in the Bundanoon area in early 2020 demonstrated. Prior to survey, 34 sites had been burnt, the impact ranging from complete destruction of the forest canopy to a burnt understorey only. These sites were surveyed a few years post-fire and it was found that the species present appeared to have changed little from the pre-fire situation, even though forest structure was completely altered. Ferns were abundant and the expected species were present; this is put down to the wet years following the fire. The severe flooding that occurred soon after the drought broke, impacted many riparian sites through extreme stream bank erosion and physical destruction by flood debris. Three *La Nina*-driven wet years following the drought helped to restore the fern flora but also triggered landslides and modified stream channels, including in rainforests on and below the escarpments.

Most survey sites are within protected areas under the *National Parks and Wildlife Act 1974* (NSW); the majority of these areas cover sandstone landscapes. Each reserve is covered by a Plan of Management that sets out the appropriate management regime to achieve conservation. An associated map-based Fire Management Strategy covers each reserve but does not identify fire exclusion areas in detail, such as rainforest gullies (e.g., NPWS 2006). It is standard practice to avoid burning rainforest, both during prescribed burns and in fighting wildfires (NPWS staff, pers. comm.).

Identification of the regional, state and national importance of the Southern Highlands for fern species conservation highlights the need for close attention to the management of key habitats within the protected areas and elsewhere. Recognition of this importance assists in developing the finer details of reserve management, such as bushfire management and the provision of visitor facilities and alerts land owners to the importance of land under their control.

A total of 709 plant species is listed as threatened in NSW under the *Biodiversity Conservation Act 2016* but only 15 of these are ferns. Ferns represent 4 % of the native flora of NSW, while the percentage of listed Threatened Species that are ferns is close to 2 %. These figures do not reflect the true situation as most of the ferns occur only in the far eastern part of the state,

where ferns represent a higher proportion of the flora, and the pressure on habitats is greatest. This suggests that ferns are under-represented on the list of the State's threatened plants, most likely due to under-investment in targeted surveys and assessments of their conservation status.

While there are no records of officially listed threatened fern species on the Southern Highlands; there are many very rare ferns that deserve better recognition as species of conservation importance. One species *Hiya distans* (PlantNET) is listed as Endangered on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. It was recorded for the first time in NSW at Macquarie Pass (described in Mills 2017), but is yet to be listed as Endangered under the NSW *Biodiversity Conservation Act 2016*. Four local ferns were listed by Briggs and Leigh (1996) (Table 2). Two of these, *Blechnum gregsonii* and *Hymenophyllum pumilum,* are known only from the Blue Mountains and Illawarra and are the only Sydney area endemic fern species. As there are only historic records from the Southern Highlands, further targeted searches are needed to evaluate their conservation threat status.

Fern species that are rare in the State and in the region deserve greater consideration in conservation planning, irrespective of listing or not. An assessment of the rainforest flora in the broader region was prepared by Mills (1988), where several ferns of conservation importance are identified; there has been no consideration of fern conservation in the region since that time. The species present and their distributions on the South Coast has been recently published (Mills 2023a).

Figure 5. A fern grotto in a gorge in Penrose State Forest near the western limit of the survey. Such sites are often dominated by *Todea barbara*, as seen here.

Conclusions

The Polypodiopsida (Pteridophyte) flora of the NSW Southern Highlands is diverse and contains a high number of botanically significant species. This study provides information on the fern flora and important fern habitats, including small gorges where the high diversity fern grottoes are to be found. Knowledge of significant fern habitats within protected areas and on private land is the first step in managing them appropriately for conservation. While the flora may seem to be well protected within reserved areas, extreme weather events associated with climate change are likely to increasingly impact fern habitats negatively posing increasing challenges for land management authorities. Few ferns are currently listed as rare or threatened and there is scope for further investigation of the potential for additional listings under the *Biodiversity Conservation Act 2016* (NSW).

Acknowledgements

The author would like to thank the anonymous reviewers who made useful comments on the draft of this paper.

References

Australia (1999) *Environment Protection and Conservation Act 1999*. Commonwealth Government, Canberra.

Briggs, J. & Leigh, J. (1996) *Rare or Threatened Australian Plants*. CSIRO, Canberra, 466 pp.

Fallding, H. & Benson, J. S. (1985) Natural vegetation and settlement at Macquarie Pass, Illawarra region. *New South Wales*. *Cunninghamia* 1: 285-311.

Kodela, P. G. (1990) Modern pollen rain from forest communities on the Robertson Plateau, New South Wales. *Australian Journal of Botany* 38(1): 1-24.

Mills, K. (1986). The Illawarra Rainforests - an Historical, Floristic and Environmental Study of their Distribution and Ecology. Ph.D. Thesis, The University of Wollongong.

Mills, K. (1988) *Conservation of Rainforest Plant Species. Illawarra Region of NSW: Inventory Assessment & Recommendations for Management*. Prepared for NSW National Parks and Wildlife Service, June.

Mills, K. (2016a) The Fern Flora of the Upper Minnamurra River Valley, Budderoo National Park, South Coast, NSW. *Illawarra Vegetation Studies* 54, Coachwood Publishing, Jamberoo, NSW, November.

Mills, K. (2016b) The Fern Flora of Macquarie Pass National Park, South Coast, NSW. *Illawarra Vegetation Studies* 55, Coachwood Publishing, Jamberoo, NSW, December.

Mills, K. (2017) The first record of the endangered fern *Hypolepis distans* Hook. (Dennstaedtiaceae) on the Australian mainland. *Cunninghamia* 17: 35-38.

Mills, K. (2020) Vegetation of Robertson Nature Reserve, Robertson Plateau, New South Wales. *Illawarra Vegetation Studies* 26, Coachwood Publishing, Jamberoo, NSW, March (revised).

Mills, K. (2021) The Fern Flora of Barren Grounds Nature Reserve, Central Tablelands, NSW. *Illawarra Vegetation Studies* 96, Coachwood Publishing, Jamberoo, NSW, October.

Mills, K. (2022a) The Fern Flora of the Bundanoon Section of Morton National Park, Central Tablelands, NSW. *Illawarra Vegetation Studies* 99, Coachwood Publishing, Jamberoo, NSW, January.

Mills, K. (2022b) The Fern Flora of Budderoo National Park (other than Minnamurra River catchment), Central Tablelands, NSW. *Illawarra Vegetation Studies* 101, Coachwood Publishing, Jamberoo, NSW, March.

Mills, K. (2022d) The Ferns of the Northern Escarpments, Morton National Park, South Coast, NSW. *Illawarra Vegetation Studies* 105, Coachwood Publishing, Jamberoo, NSW, June.

Mills, K. (2023a) *South Coast Ferns. A complete guide to the ferns and fern allies of the NSW south coast*. Envirobook, Sussex Inlet, 193 pp.

Mills, K. (2023b) Miscellaneous Fern Lists for the Southern Highlands, New South Wales. *Illawarra Vegetation Studies* 113, Coachwood Publishing, Jamberoo, NSW, September.

Mills, K. (2023c) Fern Flora of Meryla State Forest, including Meryla Flora Reserve, Central Tablelands, New South Wales. *Illawarra Vegetation Studies* 114, Coachwood Publishing, Jamberoo, NSW, September

Mills, K. & Jakeman, J. (1995) *Rainforests of the Illawarra District*. Coachwood Publishing, Jamberoo, 143 pp.

National Parks and Wildlife Service (NPWS) (2006) Barren Grounds Nature Reserve and Budderoo National Park. Fire Management Strategy. The Service, Nowra, June.

New South Wales (2016) *Biodiversity Conservation Act 2016*. NSW Government, Sydney.

Robertson Environment Protection Society (2021) *A Guide to the Robertson Rainforest*. The Society, Robertson, 112 pp.

Appendix 1. List of ferns for the Robertson-Bundanoon Highlands of New South Wales. Total number of sites is 138. The percentage frequency among the sites is the figure in brackets.

Species	No. of sites
Abrodictyum caudatum	4 (3%)
Adiantum aethiopicum	39 (28%)
Adiantum atroviride	1 (0.7%)
Adiantum diaphanum	3 (2.2%)
Adiantum formosum	15 (11%)
Adiantum hispidulum	24 (17%)
Arthropteris beckleri	7 (5%)
Arthropteris tenella	29 (21%)
Asplenium australasicum	35 (25%)
Asplenium flabellifolium	75 (54%)
Asplenium flaccidum	15 (11%)
Asplenium gracillimum	4 (3%)
Asplenium polyodon	4 (3%)
Azolla pinnata	-
Blechnum ambiguum	74 (54%)
Blechnum camfieldii	6 (4%)
Blechnum cartilagineum	94 (68%)
Blechnum chambersii (1957)	-
Blechnum gregsonii (1960,1994)	-
Blechnum minus	37 (27%)
Blechnum neohollandicum	41 (30%)
Blechnum nudum	101 (73%)
Blechnum parrisiae	6 (4%)
Blechnum patersonii	59 (43%)
Blechnum rupestre	14 (10%)
Blechnum wattsii	80 (58%)
Botrychium australe	1 (0.7%)
Calochlaena dubia	106 (77%)
Cheilanthes austrotenuifolia (1942)	-
Cheilanthes distans	2 (1.4%)
Cheilanthes sieberi	12 (9%)
Christella dentata	3 (2%)
Cyathea australis	117 (85%)
Cyathea cooperi	4 (3%)
Cyathea leichhardtiana	20 (14%)
Davallia solida var. *pyxidata*	14 (10%)
Dendroconche scandens	36 (26%)
Dennstaedtia davallioides	16 (12%)
Deparia petersenii ssp. *congrua*	4 (3%)
Dicksonia antarctica	74 (54%)
Dictymia brownii	1 (0.7%)
Diplazium australe	25 (18%)
Gleichenia dicarpa	66 (48%)
Gleichenia microphylla	91 (66%)
Gleichenia rupestris	27 (20%)
Histiopteris incisa	59 (43%)
Hymenophyllum australe	21 (15%)
Hymenophyllum bivalve	4 (3%)
Hymenophyllum cupressiforme	79 (57%)
Hymenophyllum flabellatum	11 (8%)
Hymenophyllum lyallii	24 (17%)
Hymenophyllum marginatum	2 (1.4%)
Hymenophyllum peltatum (1984)	-
Hymenophyllum pumilum (1890,1964)	-
Hymenophyllum rarum	10 (7%)
Hiya (Hypolepis) distans	1 (0.7%)
Hypolepis glandulifera	61 (44%)
Hypolepis muelleri	22 (16%)
Hypolepis rugosula	9 (6.5%)
Lastreopsis acuminata	41 (30%)
Lastreopsis decomposita	18 (13%)
Lastreopsis microsora ssp. *microsora*	25 (18%)
Lastreopsis munita (1963)	-
Leptopteris fraseri	27 (20%)
Lindsaea linearis	45 (33%)
Lindsaea microphylla	49 (36%)
Lindsaea trichomanoides	14 (10%)
Lycopodiella lateralis	11 (8%)
Lycopodium deuterodensum	40 (29%)
Marsilea mutica	-
Notogrammitis billardierei	66 (48%)
Pellaea falcata	51 (37%)
Pellaea nana	26 (19%)
Phlegmariurus varius	11 (8%)
Platycerium bifurcatum	7 (5%)
Polyphlebium venosum	13 (9%)
Polystichum australiense	18 (13%)
Polystichum formosum	1 (0.7%)
Polystichum proliferum	2 (1.4%)
Psilotum nudum	1 (0.7%)
Pteridium esculentum	118 (86%)
Pteris comans	3 (3%)
Pteris tremula	30 (22%)
Pteris umbrosa	12 (9%)
Pteris vittata	2 (1.4%)
Pyrrosia rupestris	77 (56%)
Rumohra adiantiformis	17 (12%)
Schizaea bifida	2 (1.4%)
Schizaea rupestris	36 (26%)
Selaginella uliginosa	36 (26%)
Sticherus flabellatus var. *flabellatus*	96 (70%)
Sticherus lobatus	66 (48%)
Sticherus urceolaris	14 (10%)
Tmesipteris obliqua	1 (0.7%)
Tmesipteris ovata	3 (2%)
Tmesipteris parva	11 (8%)
Tmesipteris truncata	50 (36%)
Todea barbara	112 (81%)
Zealandia pustulata	40 (29%)

BOTANIC GARDENS OF SYDNEY

Cunninghamia

A journal of plant ecology for eastern Australia

ISSN 2200 – 405X (Online)

Updating the vascular plant species flora for Wategora Reserve, Western Sydney with an intensive 4 year study

Thomas Mesaglio

Evolution & Ecology Research Centre; School of Biological, Earth and Environmental Sciences; UNSW Sydney; Sydney, NSW, AUSTRALIA
email: thomasmesaglio@gmail.com

Abstract: Much of Western Sydney's natural vegetation has been lost since European settlement, with remaining vegetation typically present as small, fragmented remnants. One such remnant, Wategora Reserve on the western bank of Duck River in Cumberland LGA, covers about 20 ha and represents one of the most important remnants of the critically endangered vegetation community *Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion*. This paper considers previous botanical surveys of the reserve and presents a new comprehensive botanical survey of the site with notes on 16 regionally significant species, including the federally listed Vulnerable species *Acacia pubescens*, the state-listed Vulnerable species *Callistemon linearifolius*, and the federally listed Endangered species *Vincetoxicum woollsii*, an 'exceptionally rare' species (Forster 1992). In total, 727 vascular plant species have been recorded for Wategora Reserve from 1976–2023.

Keywords: Botanical survey, Cumberland Plain, Duck River, iNaturalist, floristic inventory, urban biodiversity, Cumberland LGA.

Thomas Mesaglio (2024)
Updating the vascular plant species flora for Wategora Reserve, Western Sydney with an intensive 4 year study
***Cunninghamia* 24: 009–042**
doi: 10.7751/cunninghamia.2024.002

Accepted: 17 April 2024
Published: 29 April 2024

© 2024 The Author(s) or their employer(s). Published by Botanic Gardens of Sydney.
This is an open access article distributed under the Creative Commons Attribution-NonCommercial 4.0 International License (CC BY-NC)
OPEN ACCESS

Introduction

The Cumberland Plain in Western Sydney, like many parts of the world, experienced rapid urbanisation through the 20th century, and only small fragments of the natural ecosystems remain. In the Cumberland Local Government Area, for example, just 2.6% of the original native vegetation from pre-European settlement now remains (Cumberland Council 2019). One of the key remnants in the Cumberland Plain in Western Sydney is on Duck River, gazetted as Wategora Reserve in 2013 (Geographical Names Board of NSW 2024; historically referred to as Duck River Reserve, Duck River Open-Space, and Duck River Bushland Reserve), a small urban bushland reserve spanning the suburbs of Chester Hill, South Granville and Auburn. It is bounded by Wellington Road to the north, Duck River and then Auburn Golf Course to the east, sporting fields to the south, and an industrial/commercial complex to the west. Including Duck River and its eastern bank, and the small overspill carpark to the reserve's immediate south, the total area covers about 20 ha (Figure 1).

The underlying geology of Wategora is Wianamatta Group shale, with an outcropping of Minchinbury Sandstone at the central-eastern section of the reserve. The soils belong to the Birrong soil landscape (Bannerman and Hazelton 2011), with most of the reserve's topsoil being a cracking, easily eroded and saturated grey clay. The natural vegetation is an important remnant of *Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion* (CRCIF), a threatened ecological community federally listed as critically endangered by the Environment Protection Biodiversity Conservation Act (TSSC 2015). This community is highly fragmented, with >80% of remaining patches smaller than 10 ha. Although many older documents relevant to Wategora Reserve refer to the vegetation community in the reserve as *Cooks River Clay Plain Scrub Forest*, this community has been deemed to be part of a larger ecological community, namely CRCIF, and the name is no longer formally in use (see DCCEEW 2021). A second threatened ecological community, *River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*, is also present as a narrow strip either side of Duck River; this vegetation is highly degraded. Within the reserve, the CRCIF presents mostly as a mosaic of woodland and open scrub interspersed with some sections of grassland (Figure 2). Most of the overstorey of trees is dominated by *Eucalyptus moluccana*, *Eucalyptus fibrosa* and *Melaleuca decora*, with *Melaleuca nodosa* and *Eucalyptus amplifolia* in some sections. Common and widespread shrubs and smaller trees include *Melaleuca styphelioides*, *Bursaria spinosa, Notelaea longifolia, Dodonaea triquetra, Ozothamnus diosmifolius, Acacia pubescens, Acacia falcata, Acacia decurrens, Acacia parramattensis, Polyscias sambucifolia, Daviesia ulicifolia*, *Dillwynia sieberi, Pultenaea villosa, Pimelea linifolia, Indigofera australis* and *Breynia oblongifolia*. Common herbs and graminoids include *Themeda triandra, Brunoniella australis, Goodenia hederacea, Lobelia purpurascens, Wahlenbergia gracilis, Oxalis perennans, Cyanthillium cinereum, Dichondra repens, Commelina cyanea, Lepidosperma laterale, Calotis cuneifolia, Calotis lappulacea, Entolasia stricta, Polymeria calycina, Juncus usitatus* and *Euchiton sphaericus*.

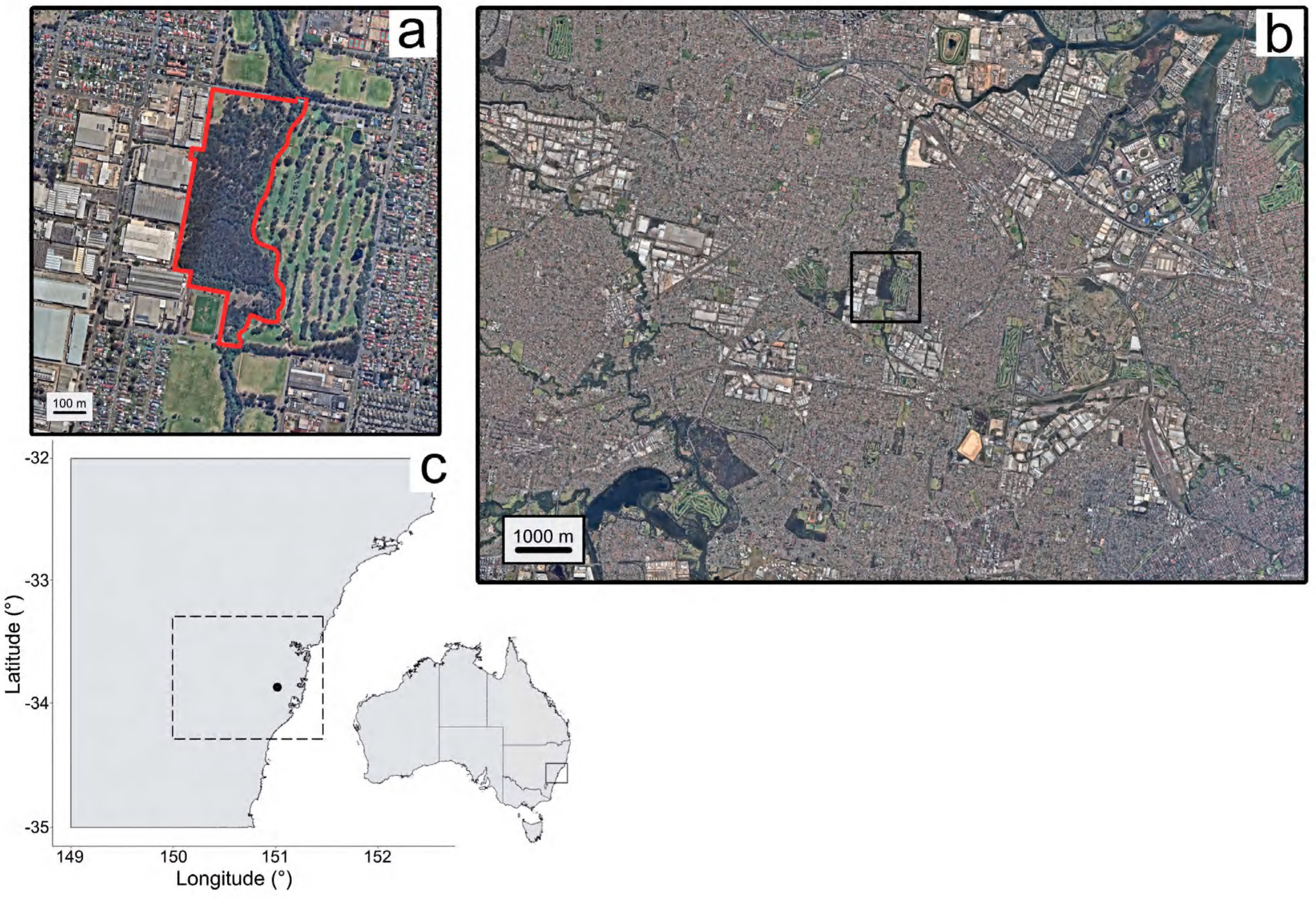


Figure 1. Study area. a) Wategora Reserve, delineated in red. b) Broader area around Wategora Reserve, highlighting the highly urbanised landscape surrounding it. Panel a) is represented by the black square. c) Location of the study area within an Australian context. The black dot represents the study area. The dotted-line box represents the Greater Sydney region. The solid-line box imposed over the map of Australia represents the area covered by the zoomed-in map on the left. Satellite imagery from Nearmap AU, dated 27 November 2021.

First Duck River survey by Tony Price, 1976–1978

Local naturalist and amateur botanist Greville Anthony 'Tony' Price conducted his first comprehensive botanical survey of Duck River (now Wategora Reserve) from 1976–1978, part of a broader effort also including similar remnant CRCIF in nearby Rookwood Cemetery. He compiled his results into a report, *The Vegetation of Duck River and Rookwood Cemetery, Auburn (with a list of species)* (Price 1979). This report remained unpublished but copies were distributed locally and available through the Library at the Royal Botanic Gardens Sydney. In 2013, Alison Hewitt published his report as Appendix 2 in *Revisiting Tony Price's (1979) account of the native vegetation of Duck River and Rookwood Cemetery, western Sydney* (Hewitt 2013), making it available online and to a much broader audience for the first time. During his three-year survey, Price recorded 468 vascular plant species (original count; including both native and non-native taxa) within Wategora Reserve.

Building on Price, 1979–1992

Three more lists were compiled for Wategora Reserve in the fourteen years after Price's original survey.

1) *List of native plants collected by G.A. Price on the Duck River Reserve, Wellington and Everley Roads, South Granville*.

   Compiled in 1988 by Price to update his 1979 list for native species only, and based on his continued surveys of Wategora Reserve from 1978–1988. It was sent to Judith Rawling, Bush Management Officer at the National Trust of Australia (NSW), in January 1988 as part of a document written by Price, *Report on the urban bushland on the Duck River in South Granville which is controlled by Parramatta City Council*. Elements of this report were incorporated into Rawling's 1990 report *Duck River Open-Space Bushland Survey*, and the species list was meant to be published as Appendix I, but due to a printing error Appendix II appeared twice, and Price's 1988 list was never published. Price recorded 267 native species (original count) from Wategora Reserve in this list (copy provided to me by Colin Gibson).

2) *List of exotic, alien native and weed species collected at the Duck River Open Space, November – December 1990*.

   A list of non-native vascular plant species in Wategora Reserve compiled in 1990 by Judith Rawling from a two-month survey conducted by Rawling and John Neff from November–December 1990. Published as Appendix II in the 1990 report *Duck River Open-Space Bushland Survey*. In this list, Rawling and Neff recorded 150 non-native species (original count) from Wategora Reserve.

3) *Species found at Duck River not on list by G.A. Price, 1988-1992*

   Compiled in 1992 by botanist Colin Gibson from his observations in Wategora Reserve from 1988–1992, with a contribution from Francine Bell, this list was designed to supplement Price (1988), focusing only on native species that Price had not observed. Originally intended as an addendum to the 1990 report *Duck River Open-Space Bushland Survey*, this list was never published. Gibson recorded 28 native species (original count) from Wategora Reserve (copy provided to me by Colin Gibson).

Comprehensive resurvey 2020–2023

From 25 April 2020 to 29 December 2023 I conducted an intensive survey of Wategora Reserve that aimed to be comprehensive, i.e., detect all species. Vascular plants were targeted, but other taxa (animals, fungi, bacteria, etc.) observed were also recorded; see Mesaglio (2022) for an illustrated, annotated checklist of all taxa. This survey also covered a ~5-ha strip of riverine vegetation along the eastern edge of Everley Park immediately south of Wategora but those records and survey efforts are excluded here to maintain the focus on Wategora Reserve.

For Wategora 117 individual visits were conducted, average survey time = 2.6 hours (range 24–417 minutes), a total survey effort of 306 hours (i.e. 15.3 hours effort-per-hectare). Visits on 25 April 2020, 8 May 2020 and 4 September 2020 were casual walkthroughs of the reserve before a decision had been made to conduct a comprehensive survey. 89 visits were conducted between 4 September 2020 and 16 December 2021 (an average of one every 5.3 days), with a longest period between surveys of 31 days (19 December 2020 to 19 January 2021). Nine visits were conducted in 2022 (14 September to 19 December), and 17 visits in 2023 (15 January to 29 December). During seven surveys, I was accompanied by an additional one or two botanists. During the survey on 21 August 2023, I was accompanied by a team of sixteen from the National Herbarium of New South Wales (Royal Botanic Gardens Sydney) as part of a collecting expedition. The period from 4 September 2020 to 16 December 2021 was the most intensive phase of my survey, whilst the sporadic surveys throughout 2022 and 2023 focused more on using the historical lists to target species I had not re-detected yet. I also included one opportunistic record of *Allocasuarina torulosa* from February 2024 (https://www.inaturalist.org/observations/198788454), a species that was recorded by Price in his 1979 and 1988 lists, but which I had not observed during my survey.

During each survey, my main goal was to observe vascular plant species not yet recorded in my previous surveys. Although no subsampling methods (quadrats, transects) were used, I followed the principle of 'sequential sampling of unusual environments' discussed by Palmer et al. (2002), that is, directed sampling of the most different or 'unusual' location or habitat compared to the most recently surveyed location within the reserve until all locations had been surveyed. Surveying was then continuously repeated across all locations, although each location or habitat was not necessarily revisited in the same order as the original series of surveys. Within each location or habitat, I also applied the principle of the 'intelligent meander' (Selva 2003, Geurts et al. 2023), derived from the Floristic Habitat Sampling method (Newmaster et al. 2005, Bowering et al. 2018), that is, actively examining as many meso- and microhabitats as possible to maximise the detection of rare species.

All species were photographed when first observed, and the photographs uploaded to the online biodiversity citizen science platform iNaturalist (www.inaturalist.org; Mesaglio and Callaghan 2021, Mesaglio 2024). Species were also rephotographed, including when a species was observed in a new location or habitat within the reserve, when it was observed flowering or fruiting for the first time that year or season, or when there was uncertainty about its identity. In total, 3,121 digital vouchers (each consisting of up to 20 images) were uploaded to iNaturalist, with all vouchers accessible in *Master Wategora Reserve Vascular*

Plant Survey 2020-2023 (https://www.inaturalist.org/projects/master-wategora-reserve-vascular-plant-survey-2020-2023), a project created to collate my survey records. Identifications were confirmed or provided by 295 other users on iNaturalist, including many professional botanists. For some records, additional identifications were sourced by cross-posting photographs to the Facebook group *NSW Plant Identification*, which is contributed to by many botanical professionals. Physical vouchers were collected under scientific license (SL100750) and deposited at the National Herbarium of New South Wales for species where identification was difficult or not feasible from photographs alone, and for notable species (new state records, rare species, etc). A total of 165 physical vouchers were collected from the reserve, including 87 vouchers collected during the herbarium expedition on 21 August 2023.

List revision and compilation

For each of the four historical lists I transcribed all reported species verbatim, updating each name where required (Appendix 1). I have followed the current taxonomy used by the Australian Plant Census. I made a further 88 changes across the four lists that were not simple updates of now synonymised names, including the removal and addition of species, and one-to-one changes (Appendix 2) based on Price's comments and observations in his 1979 report, my own survey and observations in the reserve, and extensive historical material provided to me by Colin Gibson – including bush regeneration and land management reports, and numerous items of correspondence between Gibson and Price from the 1980s and 1990s.

Although Price collected physical vouchers from Wategora Reserve, and took many of these specimens to the National Herbarium of New South Wales for identification (Price 1979, Hewitt 2013), I was unable to locate any of them. One explanation may be that Price retained his specimens in his personal collection after identification, and that, after he passed away in 2010, they were unfortunately lost or discarded. Had Price's specimens been available to examine, it is likely a few more changes would have been made to correct putative misidentifications. For example, Price recorded *Lomandra fluviatilis* as an occasional species in his 1979 list, but then omitted it from his 1988 list. I suspect that his original listing of *Lomandra fluviatilis* was actually a misidentification of *Lomandra longifolia*, which is common on-site, as there are two different 'forms' present in the reserve (a smaller, more slender form, and a larger, strappier-leaved form); my assessment is that he realised he had misidentified one of these forms as *Lomandra fluviatilis*, and corrected his error in his 1988 list. This seems especially likely given *Lomandra fluviatilis* typically occurs in creek beds on sandy soils, a habitat almost entirely absent in Wategora Reserve, and I did not detect *Lomandra fluviatilis* despite targeted searching. However, the presence of the Minchinbury Sandstone outcropping in the reserve along the creek, and the historical occurrence of other 'outlier' species in the reserve on this outcrop, e.g., *Asterolasia correifolia*, make me reticent about changing without a specimen. Also, some species in Price (1979) but then omitted from his 1988 list were not self-corrections of misidentifications, but rather species that had gone locally extinct in the years after his original survey; this may have occurred for *Lomandra fluviatilis*.

I compiled the four revised historical species lists and my survey results into a single master species list for Wategora (Appendix 1). Species represented only by known planted individuals recorded during my survey have been included in the master species list, but are excluded from all counts. Across all lists, species native to other countries, species native to other Australian states or regions of NSW but not to Sydney, and species that are otherwise native to Sydney but for which all individuals in the survey area likely originated from nearby parent plants in cultivation were all annotated as **non-native**. Two phrase name taxa were treated as species in the list, as were taxa only identifiable to genus but which were nonetheless clearly unique entities. I excluded eleven taxa from Rawling and Neff's 1990 list that were identified only to genus, could not be confidently assigned to a species, and were not unambiguously unique entities (Appendix 2).

Results

Across the four historical lists combined, 538 vascular plant species (326 genera and 93 families) were recorded in Wategora Reserve from 1976–1992, including 300 native species and 238 non-native species (Table 1). From 2020–2023, I recorded 546 species (348 genera and 102 families) in Wategora Reserve, including 274 native species and 272 non-native species (Table 2, Figure 3). Relative to the 538 historical survey species, 357 species were re-found, 181 species were not re-found, and 189 were species newly recorded during the 2020-2023 survey. In total from 1976–2023, 727 vascular plant species (421 genera and 109 families) have been recorded from Wategora Reserve, including 360 native species and 367 non-native species (Appendix 1).

Table 1. Contributions by, and changes to, historical species lists.

List	Original species count	Taxa removed	Taxa added	One-to-one name changes	Updated species count	Unique species contributed to master historical list
Price 1979	468	20	1	20	449	449
Price 1988	267	10	7	13	264	46
Rawling and Neff 1990	150	5	0	5	145	21
Gibson 1992	28	6	0	1	22	22
Total		41	8	39		538

Table 2. Categorisation of species in the current survey (2020–2023) in comparison to historical surveys (1976–1992).

	Total species	Re-detected species	New species	Species not re-detected
Native	274	214	60	86
Non-native	272	143	129	95
Total	546	357	189	181

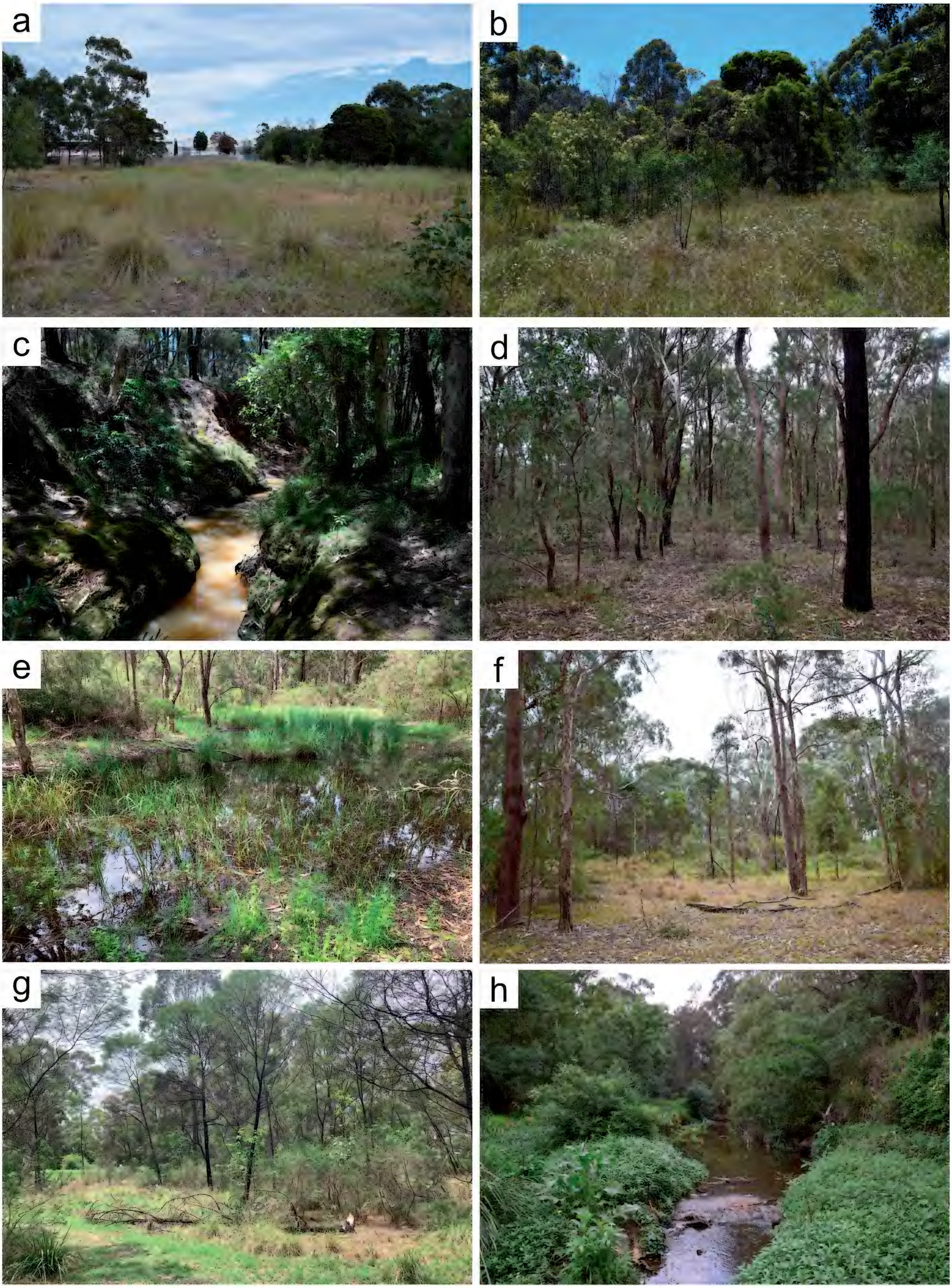


Figure 2. Diversity of habitats in Wategora Reserve. a) Large exotic grassland in the south of the reserve; b) low, open grassy woodland in the southeast of the reserve; c) shaded, heavily eroding arm of the creek cutting through the reserve; d) typical CRCIF woodland in the reserve with a canopy dominated by *Eucalyptus moluccana, Eucalyptus fibrosa* and *Melaleuca decora*; e) ephemeral wetland in swale, formed after heavy rains; f) taller, more open woodland with a stronger grass layer characteristic of the north of the reserve, with *Eucalyptus amplifolia* appearing as a common tree; g) *Acacia decurrens* and *Ozothamnus diosmifolius* low woodland over exotic lawn in the northeast of the reserve; h) Duck River, the banks dominated by dense weeds.

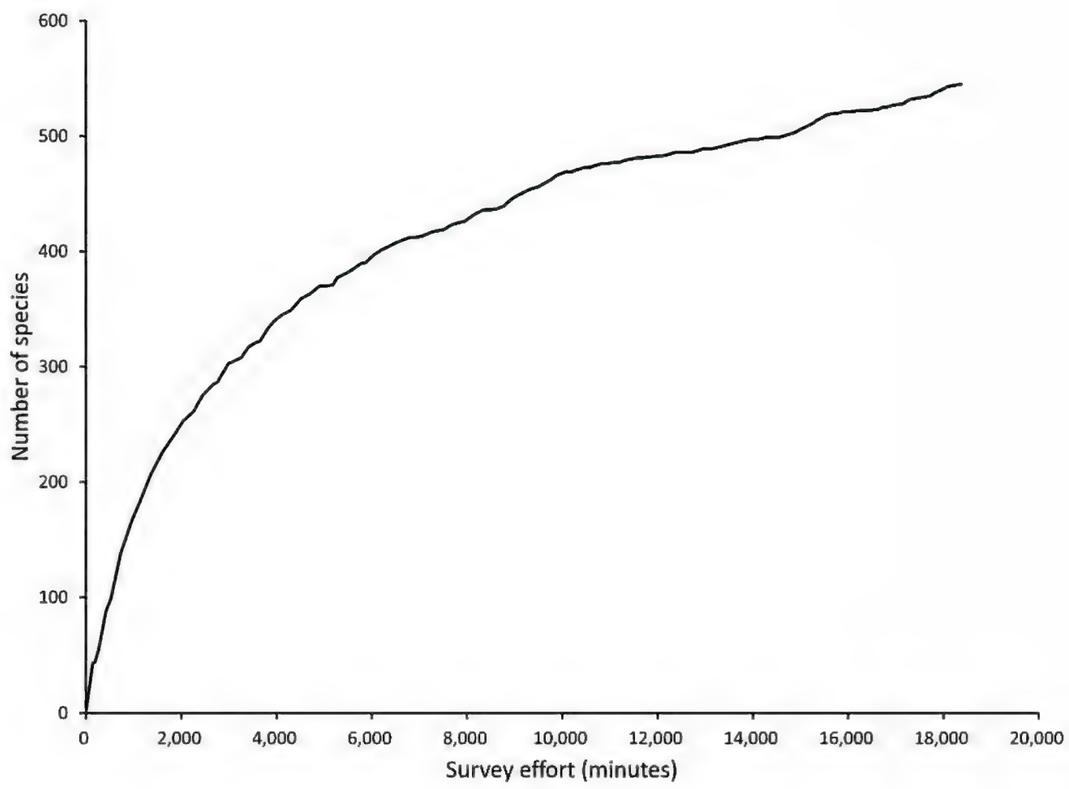


Figure 3. Species accumulation curve for current survey (2020–2023). Note that this curve does not include *Allocasuarina torulosa*, which was observed on 9 February 2024 outside the formal survey period.

Discussion

Over a period of 48 years, 727 vascular plant species have been recorded from Wategora Reserve in an area of about 20 ha, but more than 50% are non-native in the context of the reserve. Most of these species are non-native to Australia, although this count also includes 13 species native to other regions of Australia (mostly northern New South Wales and Queensland, e.g., *Grevillea robusta, Callistemon viminalis*), and 12 species with native distributions that do include Sydney, but do not occur naturally in the reserve, individuals having naturalised from nearby plants in cultivation (e.g., *Tristaniopsis laurina*, a common street tree in the surrounding suburbs; *Syzygium oleosum*, a common garden ornamental). There are 16 species on Australia's list of Weeds of National Significance – *Lycium ferocissimum*, *Alternanthera philoxeroides*, *Asparagus aethiopicus*, *Chrysanthemoides monilifera, Rubus anglocandicans, Rubus laciniatus, Asparagus asparagoides, Dolichandra unguis-cati, Sagittaria platyphylla, Senecio madagascariensis, Lantana camara, Anredera cordifolia, Genista monspessulana, Opuntia stricta, Opuntia monacantha,* and *Pontederia crassipes* – that have been recorded from the reserve, although only ten are still present.

For native vegetation, 360 native species recorded from an area of about 20 ha within such a highly urbanised and degraded landscape (Figure 1) is exceptional, representing more than a quarter of all the native species recorded from Western Sydney (James et al. 1999). More significantly these species are part of the *Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion* threatened ecological community; despite the importance and increasing rarity of this vegetation community, knowledge is very limited. Pendall et al. (2022) conducted one of the few surveys of CRCIF, recording 169 vascular plant species (153 native, 16 non-native) across 52, 20 x 20 m plots from seven locations in Western Sydney from 2020–2021. Comprehensive surveys of relatively small areas tend to be similarly rare. Atha et al. (2020) conducted a similar intensive survey of New York's Central Park (341 ha) from 2013–2017, finding 438 vascular plant species (198 native, 240 non-native).

Significant species

Wategora Reserve includes nine species listed as regionally significant in James et al.'s 1999 *Rare Bushland Plants of Western Sydney*:

1. ***Polygala japonica*** (possibly extant). Not recorded by Price in the 1970s and 1980s, but detected by Gibson in 1992, whose field notes indicate 'Northern area near grassland'; although some of this section has since been cleared and converted to lawn, with *Eragrostis curvula* also invading especially aggressively among a number of weed species, there is still intact grassy woodland here that should be suitable habitat. I was unable to find this species again, but it may still be present.
2. ***Asterolasia correfolia*** (extinct). There was a small, isolated population of this species in the reserve at the Minchinbury Sandstone outcropping (this population was explicitly mentioned in James et al. 1999); however, this species is almost certainly now locally extinct. Already reported as rare by Price in 1979, the population dwindled to a single known individual, last observed in October 2014 by Daniel Smart. I searched intensively for this species in the reserve, including with Smart on one occasion at the last individual's exact location, but could not relocate it.
3. ***Paspalidium gracile*** (extant). A few small patches present in *Melaleuca* woodland near the western arm of the creek.
4. ***Acacia pubescens*** (extant; Figure 4a). Wategora Reserve contains one of the largest remaining populations of *Acacia pubescens*, a state and federally listed Vulnerable species largely restricted to Greater Sydney. It is very common on-site and distributed across every section of the reserve. This species flowered prolifically across the reserve each August and September during my survey, although very little fruit was produced despite an abundance of pollinators observed visiting flowers.
5. ***Solenogyne dominii*** (extant; Figure 4b). Uncommon in the reserve, mostly as single scattered individuals.
6. ***Callistemon linearifolius*** (extant; Figure 4c). A state-listed Vulnerable species. Fairly well-represented in the reserve with ~20 known individuals scattered across a wide range, including saplings and adult plants.
7. ***Stackhousia muricata*** (extant; Figure 4d). Fairly widespread throughout the lower two thirds of the reserve, mostly in very open sections of woodland. Only appeared in the reserve after persistent heavy rain in November 2021.
8. ***Vittadinia sulcata*** (extant; Figure 4e). Rare in grassy woodland in the northeast of the reserve, growing with *Calotis cuneifolia*.
9. ***Vincetoxicum woollsii*** (extant; Figure 4f). Listed as Endangered at both a state and federal level, this was the most exciting discovery from my survey, and one of the most significant species for Wategora.

Described by Bentham (1868) as *Tylophora woollsii*, the holotype was collected by William Woolls, probably in the 1860s, with the location given only as 'Paramatta' [sic]. More than one hundred years elapsed before the species was rediscovered by J.B. Williams in northern New South Wales near Clouds Creek in 1964. Since then more populations have been found further north in New South Wales and just across the border in far southern Queensland, but as noted by Forster (1992), *Vincetoxicum woollsii is an exceptionally rare plant*.

Figure 4. Regionally significant plant species referred to in *Rare Bushland Plants of Western Sydney* and recorded from Wategora Reserve. a) *Acacia pubescens*; b) *Solenogyne dominii*; c) *Callistemon linearifolius*; d) *Stackhousia muricata*; e) *Vittadinia sulcata*; f) *Vincetoxicum woollsii*.

For the Sydney area James et al. (1999) listed the species as *Extremely rare…now believed extinct in Sydney region*, but in March of that year, Colin Gibson rediscovered *Vincetoxicum woollsii* in Sydney at Norfolk Reserve, Chullora, an isolated 2 ha bushland fragment 5–6 km southeast of Wategora Reserve, the first time the species had been seen in Sydney for over 135 years. In January 2006 the four individuals at Norfolk Reserve were feared to have been killed when the temperature hit 45°C in Sydney and all aboveground portions of the plants disappeared, however, some weak stems reappeared several months later (Gibson 2008). The population completely disappeared from aboveground soon after, was still absent aboveground in 2018, but was re-sighted in 2021 and is still extant in 2024 (C. Gibson, pers. comm.).

My discovery of two *Vincetoxicum woollsii* individuals in Wategora Reserve in November 2021 was only the third record from Sydney of what is *perhaps Sydney's rarest plant* (Gibson 2008). Their aboveground appearance was almost certainly linked to the La Niña conditions of 2020–2022 when the reserve received considerable amounts of rain (Figure 5). Like the Norfolk population the two plants retreated belowground again during the drier conditions of 2023, with no aboveground material in Wategora Reserve for most of 2023. However, as of early February 2024, after heavy rain in early December 2023, both individuals have produced stems and leaves again. Unfortunately, *Vincetoxicum woollsii* in Wategora Reserve is not only vulnerable to hot and dry conditions, but also under constant attack by oleander aphids (*Aphis nerii*), an introduced species to Australia (Blackman and Eastop 2000), moving across from nearby patches of *Araujia sericifera*, a common weed in the reserve.

There are also species that, whilst not mentioned in James et al. (1999), are also regionally significant, with few known populations or recent records in Western Sydney, including (Figure 6):

10. ***Myoporum boninense*** (Figure 6a). Seven or eight large individuals scattered throughout the core of the reserve, mostly close to the western arm of the creek. This is typically a coastal heath species; Wategora Reserve is one of few inland populations, and represents the western limit of this species.
11. ***Macrozamia spiralis*** (Figure 6b). Nine individuals scattered throughout the reserve, with one producing a cone in 2021.
12. ***Pterostylis rufa*** (Figure 6c). At least 200 plants present, possibly 250+, almost all of them on a single long, barrow-like mound of soil. Prolific flowering of the entire population occurred in 2021. One of, possibly the largest known extant population in Western Sydney.
13. ***Pittosporum multiflorum*** (Figure 6d). Single large, dense patch of 30-40 individuals growing alongside the western arm of the creek.
14. ***Glossocardia bidens*** (Figure 6e). Appeared aboveground, flowered and fruited in a few locations in the reserve throughout 2021, likely in response to the significant rainfall throughout 2020 and 2021. Has not appeared aboveground since.
15. ***Crassula peduncularis*** (Figure 6f). Rarely collected in Sydney, large patches of this species appeared in September 2022 after months of rainfall, growing in wet, shaded, heavy clay with mosses and liverworts. Disappeared shortly after with the onset of drier conditions.
16. ***Maireana microphylla*.** Another species with very few recent records from Sydney, and now likely locally extinct here. This species was only ever known from a single individual in the reserve (C. Gibson, pers. comm.). I searched the known location intensively, including with Colin Gibson, but we could not detect it.

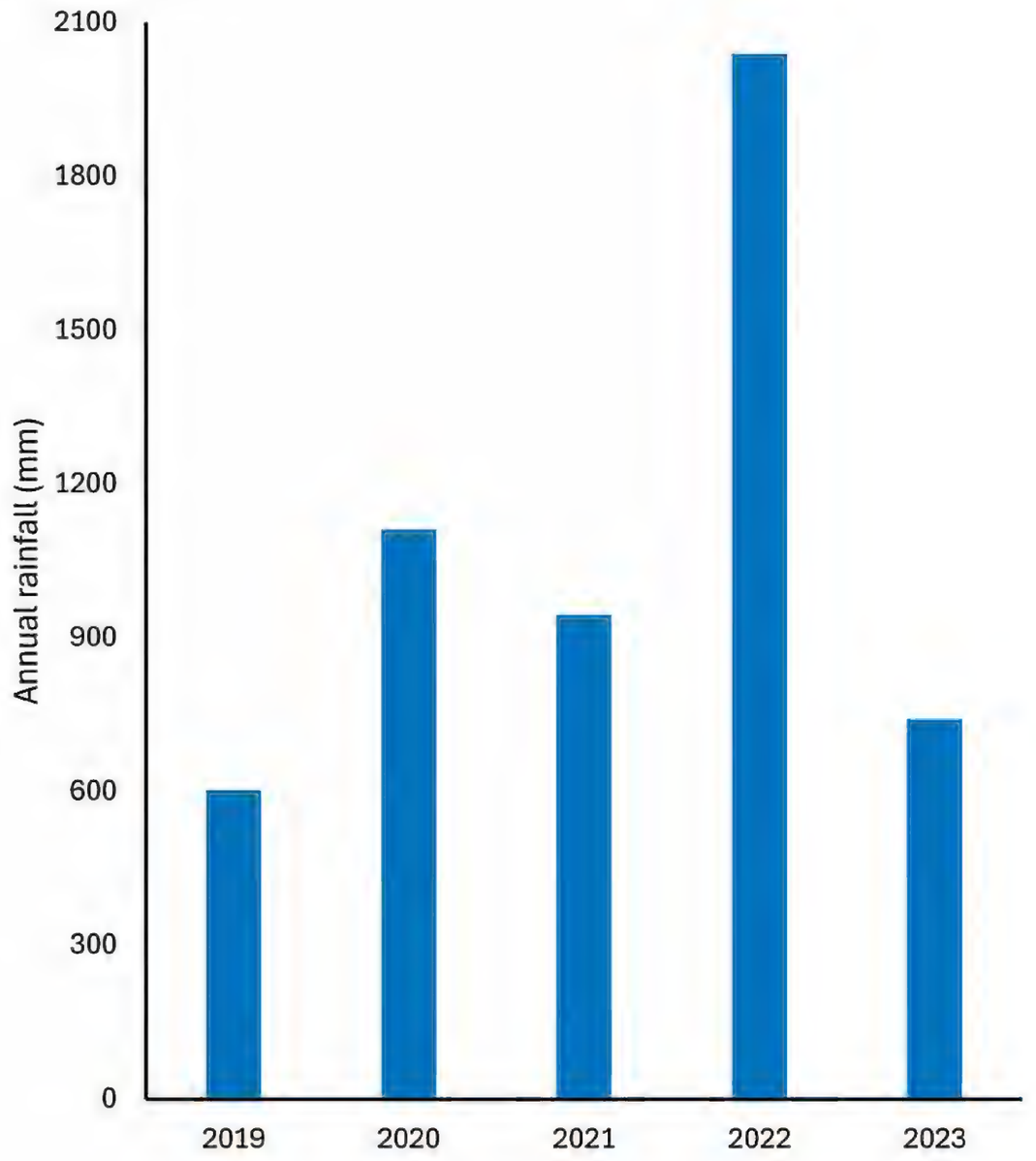


Figure 5. Annual rainfall for Western Sydney from 2019–2023. Data are from the Bureau of Meteorology from the Bankstown Airport Automatic Weather Station (33.92°S, 150.98°E), 6.3 km southwest of Wategora Reserve.

Future work

Discovery of more species is still likely in Wategora Reserve, and indeed I recorded at least one new species in each of my final ten surveys, including eight new species in my last three surveys. For species already present in the reserve but as yet undetected, the most likely future discoveries will be:

1) Disturbance responders (e.g., *Trema tomentosa*, which I recorded for the first time after excavation and tree removal during public works disturbed the soil and opened up the canopy).
2) Ephemeral herbs and grasses responding to conditions such as heavy rain (e.g., *Crassula peduncularis*, which only appeared aboveground in September 2022 after record-breaking rain throughout the year, then disappeared soon after during drier conditions in early November).
3) Rare species represented by one or very few individuals in the reserve, especially those along near-inaccessible sections of the creek (e.g., *Pteris vittata*, with only a single known individual in the reserve growing on a heavily eroding, densely vegetated creekbank among industrial waste).

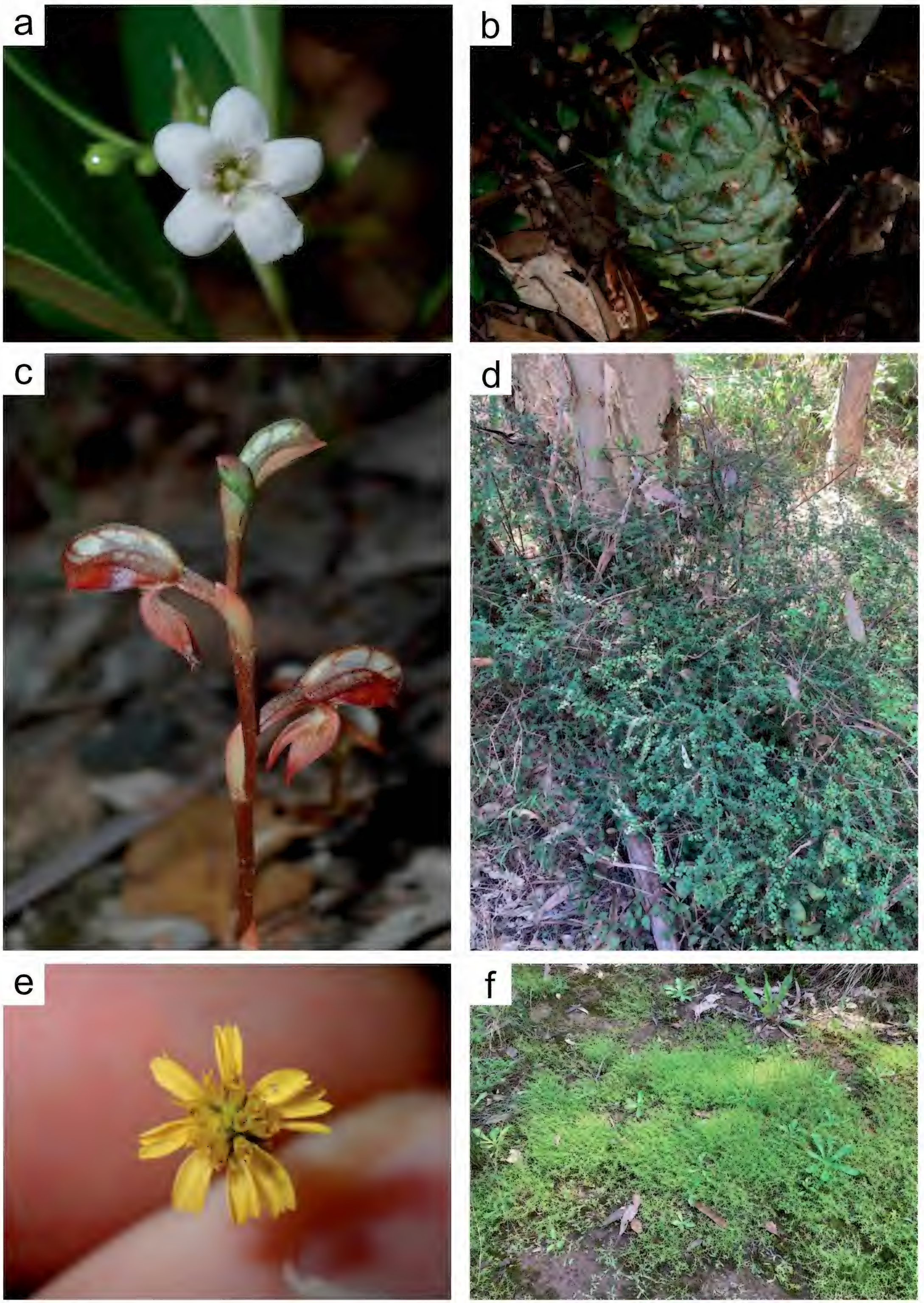


Figure 6. Other regionally significant plant species recorded from Wategora Reserve. a) *Myoporum boninense*; b) *Macrozamia spiralis*; c) *Pterostylis rufa*; d) *Pittosporum multiflorum*; e) *Glossocardia bidens*; f) *Crassula peduncularis*.

For new species entering the reserve, the majority will likely be non-native given-

1) how little high-quality bushland exists in the vicinity around the reserve for species to disperse from (Figure 1b);
2) the similarity of the closest fragments, with relatively few native species that aren't already known from Wategora Reserve; and,
3) the abundance and high diversity of non-native species already present in the immediate surroundings, as well as the proximity of the Auburn Botanic Gardens as a source of newly naturalising species. I have recorded more than 40 naturalised non-native species within a 500 m radius of the reserve that are yet to be detected in the reserve itself, including easily dispersed species such as *Solanum sisymbriifolium* and *Dipogon lignosus*. Of the 189 species I recorded that were not reported in any historical survey, almost 70% were non-native. And indeed, some of the 'new' native species I recorded have likely always been present in the reserve, but were either not present aboveground during historical surveys, or have always been rare and were previously overlooked.

Future taxonomic updates may increase the number of recognised species for Wategora Reserve; I have observed multiple morphotypes on site which may be elevated to species or described as new species (Appendix 3).

Acknowledgements

I am indebted to Colin Gibson for the invaluable insights, information, and assistance he provided; Peter Ridgeway, Peter Dixon, Daniel Smart, Damien Vella, Guy Taseski, Will Cornwell, Hervé Sauquet and Kate Mesaglio for their useful insights and assistance; and, to the many experts who provided identifications, including those on iNaturalist, the NSW Plant Identification Facebook page, and at the Botanical Identification Service of the National Herbarium of New South Wales. Thanks also to the team from the National Herbarium of New South Wales that visited Wategora Reserve in August 2023 to conduct a collecting expedition, to Hannah McPherson for access to *Vincetoxicum woollsii* specimens, and to the anonymous reviewer for their helpful suggestions which improved this manuscript.

References

Albrecht, D.E. and Crisp, M.D., 1993. *Dillwynia sieberi* distinguished from *D. juniperina* (Fabaceae: Mirbelieae) in south-eastern Australia. *Muelleria*, 8, pp.47-50.

Atha, D., Alvarez, R.V., Chaya, K., Catusco, J.P. and Whitaker, E., 2020. The Spontaneous Vascular Plant Flora of New York's Central Park1. *The Journal of the Torrey Botanical Society*, 147(1), pp.94-116.

Bannerman, S.M. and Hazelton, P.A., 2011, Soil Landscapes of the Penrith 1:100,000 Sheet interactive CD-ROM, NSW Office of Environment and Heritage, Sydney.

Bean, A.R. and Wang, J., 2017. The identity and typification of *Ixauchenus sublyratus* Cass. (Asteraceae). *Adansonia*, 39, pp.167-170.

Bentham, G., 1868. Order LXXVI. Asclepiadeae. In: *Flora Australiensis*, vol. 4. Reeve & Co., London, pp. 324-348.

Blackman, R.L. and Eastop, V.F., 2000. *Aphids on the world's crops: an identification and information guide*, 2nd Edition. Wiley.

Bowering, R., Wigle, R., Padgett, T., Adams, B., Cote, D. and Wiersma, Y.F., 2018. Searching for rare species: A comparison of Floristic Habitat Sampling and Adaptive Cluster Sampling for detecting and estimating abundance. *Forest Ecology and Management*, 407, pp.1-8.

Cumberland Council, 2019. Cumberland Biodiversity Strategy 2019. URL

Department of Climate Change, Energy, the Environment and Water (DCCEEW), 2021. Cooks River Clay Plain Scrub Forest. Advice to the Minister for the Environment and Heritage from the Threatened Species Scientific Committee (TSSC) on Amendments to the List of Ecological Communities under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). URL

Forster, P.I., 1992. A taxonomic revision of *Tylophora* R. Br.(Asclepiadaceae: Marsdenieae) in Australia. *Australian Systematic Botany*, 5(1), pp.29-51.

Geographical Names Board of NSW, 2024. NSW Government. URL

Geurts, E.M., Reynolds, J.D. and Starzomski, B.M., 2023. Not all who wander are lost: Trail bias in community science. *Plos One*, 18(6), p.e0287150.

Gibson, C., 1992. *Species found at Duck River not on list by G.A. Price*. Unpublished.

Gibson, C., 2008. *Tylophora woollsii* at Chullora. Report on Envirofund Project no. 51916.

Hewitt, A., 2013. Revisiting Tony Price's (1979) account of the native vegetation of Duck River and Rookwood Cemetery, western Sydney. *Cunninghamia*, 13, pp.25-124.

James, T., Benson, D.H. and McDougall, L., 1999. *Rare Bushland Plants of Western Sydney*, second edition. Royal Botanic Gardens Sydney.

Jiménez-López, F.J., Viruel, J., Arista, M., Ortiz, P.L. and Talavera, M., 2022. Molecular approaches reveal speciation between red-and blue-flowered plants in the Mediterranean *Lysimachia arvensis* and *L. monelli* (Primulaceae). *Botanical Journal of the Linnean Society*, 199(2), pp.557-577.

Johnson, S., 2007. Review of the declaration of *Lantana* species in New South Wales. NSW Department of Primary Industries. URL

Mesaglio, T. and Callaghan, C.T., 2021. An overview of the history, current contributions and future outlook of iNaturalist in Australia. *Wildlife Research*, 48(4), pp.289-303.

Mesaglio, T., 2022. Comprehensive biodiversity survey of Wategora Reserve and Everley Park along Duck River, western Sydney. Ecoevorxiv. Preprint, Version 1.5. Updated 1 February 2024. Available from DOI.

Mesaglio, T., 2024. A Guide to iNaturalist: An Australian perspective, *Atlas of Living Australia, Publication Series* No. 12, Canberra, Australia, pp. 81. DOI

Newmaster, S.G., Belland, R.J., Arsenault, A., Vitt, D.H. and Stephens, T.R., 2005. The ones we left behind: comparing plot sampling and floristic habitat sampling for estimating bryophyte diversity. *Diversity and Distributions*, 11(1), pp.57-72.

Orchard, A.E., 2017. A revision of *Cassinia* (Asteraceae: Gnaphalieae) in Australia. 7. *Cassinia* subgenus *Achromolaena*. *Australian Systematic Botany*, 30, pp.337-370.

Palmer, M.W., Earls, P.G., Hoagland, B.W., White, P.S. and Wohlgemuth, T., 2002. Quantitative tools for perfecting species lists. Environmetrics: *The official journal of the International Environmetrics Society*, 13(2), pp.121-137.

Pendall, E., Hewitt, A., Boer, M.M., Carrillo, Y., Glenn, N.F., Griebel, A., Middleton, J.H., Mumford, P.J., Ridgeway, P., Rymer, P.D. and Steenbeeke, G.L., 2022. Remarkable resilience of forest structure and biodiversity following fire in the peri-urban bushland of Sydney, Australia. *Climate*, 10(6), p.86.

Price, G.A., 1979. *The Vegetation of Duck River and Rookwood Cemetery, Auburn (with a list of species)*. Unpublished.

Price, G.A., 1988. *List of native plants collected by G.A.Price on the Duck River Reserve, Wellington and Everley Roads, South Granville*. Unpublished.

Rawling, J., 1990. Duck River Open-Space Bushland Survey.

Selva, S.B., 2003. Using calicioid lichens and fungi to assess ecological continuity in the Acadian Forest Ecoregion of the Canadian Maritimes. The Forestry Chronicle, 79(3), pp.550-558.

Short, P.S., 2009. A revision of the *Brachyscome linearifolia* group (Asteraceae: Astereae) from south-eastern Australia. *Muelleria*, 27, pp.3-35.

Short, P.S., 2014. A taxonomic review of *Brachyscome* Cass. s. lat.(Asteraceae: Astereae), including descriptions of a new genus, *Roebuckia*, new species and new infraspecific taxa. Journal of the Adelaide Botanic Gardens, 28, pp.1-219.

Smith, L.S. and Smith, D.A., 1982. The naturalized *Lantana camara* complex in eastern Australia. *Queensland Botany Bulletin*, 1, pp.1-26.

Thompson, I.R., 2005. Taxonomic studies of Australian *Senecio* (Asteraceae): 5. The *S. pinnatifolius*/*S. lautus* complex. *Muelleria*, 21, pp.23-76.

Threatened Species Scientific Committee (TSSC), 2015. Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (s266B) Approved Conservation Advice (including listing advice) for Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion. URL

Wang, J. and Bean, A.R., 2019. A taxonomic revision of *Lagenophora* Cass.(Asteraceae) in Australia. *Austrobaileya*, 10, pp.405-442.

Weber, J.Z., 1981. A taxonomic revision of *Cassytha* (Lauraceae) in Australia. *Journal of the Adelaide Botanic Garden*, 3, pp.187-262.

Appendix 1: Master species list for Wategora Reserve across 1976–2023, with contributions by Price 1979 and Price 1988 (survey conducted from 1976–1988), Rawling and Neff 1990 (1990), Gibson 1992 (1988–1992) and Mesaglio 2024 (2020–2023). Taxa are identified to an infraspecific rank where possible, but multiple infraspecific taxa within a single species are not treated as unique entities within the list (i.e., a species for which two subspecies have been observed in the reserve is counted as one entity).

Family	Species	Origin *=non native	Price 1979	Price 1988	Rawling Neff 1990	Gibson 1992	Mesaglio 2024
Acanthaceae	*Brunoniella australis* (Cav.) Bremek.	native	Y	Y	N		Y
Acanthaceae	*Brunoniella pumilio* (R.Br.) Bremek.	native	Y	Y	N		Y
Agapanthaceae	*Agapanthus africanus* (L.) Hoffmanns.	*	N	N	Y		N
Agapanthaceae	*Agapanthus praecox* subsp. *orientalis* (F.M.Leight.) F.M.Leight.	*	Y	N	Y		Y
Aizoaceae	*Mesembryanthemum cordifolium* L.f.	*	Y	N	N		N
Aizoaceae	*Tetragonia tetragonoides* (Pall.) Kuntze	native	N	N	N		Y
Alismataceae	*Sagittaria platyphylla* (Engelm.) J.G.Sm.	*	Y	N	Y		N
Alliaceae	*Nothoscordum borbonicum* Kunth	*	Y	N	Y		Y
Amaranthaceae	*Alternanthera denticulata* R.Br.	native	Y	Y	N		Y
Amaranthaceae	*Alternanthera philoxeroides* (Mart.) Griseb.	*	Y	N	Y		Y
Amaranthaceae	*Alternanthera pungens* Kunth	*	N	N	N		Y
Amaranthaceae	*Alternanthera* sp. A Flora of NSW (M.Gray 5187) J.Palmer	native	N	N	N		Y
Amaranthaceae	*Amaranthus hybridus* L.	*	Y	N	N		N
Amaranthaceae	*Amaranthus viridis* L.	*	N	N	N		Y
Amaranthaceae	*Gomphrena celosioides* Mart.	*	N	N	N		Y
Amaryllidaceae	*Clivia* sp.	*	N	N	N		Y
Amaryllidaceae	*Crinum pedunculatum* R.Br.	*	Y	N	Y		N
Amaryllidaceae	*Hippeastrum puniceum* (Lam.) Kuntze	*	Y	N	Y		N
Amaryllidaceae	*Leucojum aestivum* L.	*	Y	N	N		N
Anacardiaceae	*Harpephyllum caffrum* Bernh. ex C.Krauss	*	N	N	N		Y
Anacardiaceae	*Pistacia chinensis* Bunge	*	N	N	N		Y
Apiaceae	*Apium graveolens* L.	*	Y	N	Y		Y
Apiaceae	*Centella asiatica* (L.) Urb.	native	N	Y	N		Y
Apiaceae	*Cyclospermum leptophyllum* (Pers.) Sprague ex Britton & P.Wilson	*	Y	N	N		Y
Apiaceae	*Foeniculum vulgare* Mill.	*	Y	N	Y		Y
Apiaceae	*Petroselinum crispum* (Mill.) Fuss	*	N	N	N		Y
Apocynaceae	*Araujia sericifera* Brot.	*	Y	N	Y		Y
Apocynaceae	*Asclepias curassavica* L.	*	N	N	N		Y
Apocynaceae	*Gomphocarpus physocarpus* E.Mey.	*	N	N	N		Y
Apocynaceae	*Narcissus* sp.	*	Y	N	Y		N
Apocynaceae	*Nerium oleander* L.	*	Y	N	Y		N
Apocynaceae	*Parsonsia straminea* (R.Br.) F.Muell.	native	Y	N	N		N
Apocynaceae	*Vinca* sp.	*	N	N	Y		N
Apocynaceae	*Vincetoxicum barbatum* (R.Br.) Kuntze	native	Y	Y	N		Y
Apocynaceae	*Vincetoxicum woollsii* (Benth.) Kuntze	native	N	N	N		Y
Araceae	*Alocasia macrorrhizos* (L.) G.Don	*	N	N	Y		N
Araceae	*Colocasia esculenta* (L.) Schott cv. 'Fontanesii'	*	N	N	N		Y
Araceae	*Lemna disperma* Hegelm.	native	N	N	N		Y
Araceae	*Zantedeschia aethiopica* (L.) Spreng.	*	Y	N	Y		N
Araliaceae	*Hydrocotyle bonariensis* Lam.	*	N	N	Y		Y
Araliaceae	*Hydrocotyle sibthorpioides* Lam.	native	N	Y	N		Y
Araliaceae	*Polyscias sambucifolia* (Sieber ex DC.) Harms	native	Y	Y	N		Y
Araucariaceae	*Araucaria heterophylla* (Salisb.) Franco	planted	N	N	N		Planted

Family	Species	Origin *=non native	Price 1979	Price 1988	Rawling Neff 1990	Gibson 1992	Mesaglio 2024
Arecaceae	*Livistona australis* (R.Br.) Mart.	*	N	N	N		Y
Arecaceae	*Phoenix canariensis* H.Wildpret	*	N	N	N		Y
Arecaceae	*Syagrus romanzoffiana* (Cham.) Glassman	*	N	N	N		Y
Asparagaceae	*Agave* sp.	planted	N	N	N		Planted
Asparagaceae	*Arthropodium minus* R.Br.	native	N	Y	N		N
Asparagaceae	*Arthropodium* sp. South-east Highlands (N.G.Walsh 811) Vic. Herbarium	native	Y	Y	N		Y
Asparagaceae	*Arthropodium strictum* R.Br.	native	N	Y	N		N
Asparagaceae	*Asparagus aethiopicus* L.	*	Y	N	Y		Y
Asparagaceae	*Asparagus asparagoides* (L.) W.Wight	*	Y	N	Y		Y
Asparagaceae	*Asparagus officinalis* L.	*	Y	N	N		Y
Asparagaceae	*Asparagus plumosus* Baker	*	Y	N	N		N
Asparagaceae	*Asparagus virgatus* Baker	*	N	N	N		Y
Asparagaceae	*Chlorophytum comosum* (Thunb.) Jacques	*	N	N	Y		Y
Asparagaceae	*Dracaena draco* (L.) L.	*	N	N	N		Y
Asparagaceae	*Dracaena trifasciata* (Prain) Mabb.	*	N	N	N		Y
Asparagaceae	*Eustrephus latifolius* R.Br.	native	Y	Y	N		Y
Asparagaceae	*Laxmannia gracilis* R.Br.	native	Y	Y	N		Y
Asparagaceae	*Lomandra filiformis* subsp. *coriacea* A.T.Lee	native	Y	Y	N		Y
Asparagaceae	*Lomandra fluviatilis* (R.Br.) A.T.Lee	native	Y	N	N		N
Asparagaceae	*Lomandra longifolia* Labill.	native	Y	Y	N		Y
Asparagaceae	*Lomandra multiflora* (R.Br.) Britten subsp. *multiflora*	native	Y	Y	N		Y
Asparagaceae	*Thysanotus tuberosus* R.Br.	native	Y	Y	N		Y
Asparagaceae	*Yucca* sp.	planted	N	N	N		Planted
Asphodelaceae	*Aloe arborescens* Mill.	planted	N	N	N		Planted
Asphodelaceae	*Aloe maculata* All.	*	Y	N	Y		Y
Aspleniaceae	*Asplenium australasicum* (J.Sm.) Hook.	native	N	N	N		Y
Aspleniaceae	*Asplenium flabellifolium* Cav.	native	N	N	N		Y
Asteraceae	*Ageratina adenophora* (Spreng.) R.M.King & H.Rob.	*	Y	N	Y		Y
Asteraceae	*Ageratina riparia* (Regel) R.M.King & H.Rob.	*	N	N	N		Y
Asteraceae	*Arctotheca calendula* (L.) K.Lewin	*	Y	N	N		Y
Asteraceae	*Artemisia verlotiorum* Lamotte	*	Y	N	N		Y
Asteraceae	*Bidens alba* (L.) DC.	*	N	N	N		Y
Asteraceae	*Bidens pilosa* L.	*	Y	N	Y		Y
Asteraceae	*Bidens subalternans* DC.	*	Y	N	Y		Y
Asteraceae	*Brachyscome graminea* (Labill.) F.Muell.	native	Y	Y	N		N
Asteraceae	*Brachyscome triloba* Gaudich.	native	Y	N	N		Y
Asteraceae	*Calotis cuneifolia* R.Br.	native	Y	Y	N		Y
Asteraceae	*Calotis lappulacea* Benth.	native	Y	Y	N		Y
Asteraceae	*Carduus pycnocephalus* L.	*	N	N	N		Y
Asteraceae	*Cassinia sifton* Orchard	native	Y	Y	N		Y
Asteraceae	*Centipeda minima* (L.) A.Braun & Asch. subsp. *minima*	native	Y	Y	N		Y
Asteraceae	*Chrysanthemoides monilifera* (L.) Norl.	*	Y	N	Y		N
Asteraceae	*Chrysocephalum apiculatum* (Labill.) Steetz	native	Y	Y	N		Y
Asteraceae	*Cichorium intybus* L.	*	Y	N	N		N
Asteraceae	*Cirsium vulgare* (Savi) Ten.	*	Y	N	Y		Y
Asteraceae	*Coronidium scorpioides* (Labill.) Paul G.Wilson	native	Y	Y	N		N
Asteraceae	*Cotula australis* (Sieber ex Spreng.) Hook.f.	native	Y	Y	N		Y
Asteraceae	*Cotula coronopifolia* L.	*	Y	N	N		N

Family	Species	Origin *=non native	Price 1979	Price 1988	Rawling Neff 1990	Gibson 1992	Mesaglio 2024
Asteraceae	*Crassocephalum crepidioides* (Benth.) S.Moore	*	N	N	N		Y
Asteraceae	*Cyanthillium cinereum* (L.) H.Rob.	native	Y	Y	N		Y
Asteraceae	*Delairea odorata* Lem.	*	N	N	N		Y
Asteraceae	*Dimorphotheca ecklonis* DC.	*	N	N	N		Y
Asteraceae	*Erechtites valerianifolius* (Link ex Spreng.) DC.	*	N	N	N		Y
Asteraceae	*Erigeron bonariensis* L.	*	Y	N	Y		Y
Asteraceae	*Erigeron sumatrensis* Retz.	*	Y	N	N		Y
Asteraceae	*Euchiton involucratus* (G.Forst.) Holub	native	N	N	N		Y
Asteraceae	*Euchiton japonicus* (Thunb.) Holub	native	Y	Y	N		N
Asteraceae	*Euchiton sphaericus* (Willd.) Holub	native	N	N	N	Y	Y
Asteraceae	*Euryops chrysanthemoides* (DC.) B.Nord.	*	N	N	N		Y
Asteraceae	*Facelis retusa* (Lam.) Sch.Bip.	*	Y	N	N		Y
Asteraceae	*Galinsoga parviflora* Cav.	*	N	N	N		Y
Asteraceae	*Gamochaeta calviceps* (Fernald) Cabrera	*	N	N	N		Y
Asteraceae	*Gamochaeta impatiens* G.L.Nesom	*	N	N	N		Y
Asteraceae	*Gamochaeta pensylvanica* (Willd.) Cabrera	*	N	N	N		Y
Asteraceae	*Gamochaeta purpurea* (L.) Cabrera	*	Y	N	Y		N
Asteraceae	*Gamochaeta* sp.	*	N	N	N		Y
Asteraceae	*Glossocardia bidens* (Retz.) Veldkamp	native	N	Y	N		Y
Asteraceae	*Helianthus annuus* L.	*	Y	N	N		Y
Asteraceae	*Hypochaeris albiflora* (Kuntze) Azevedo-Gonc. & Matzenb.	*	N	N	N		Y
Asteraceae	*Hypochaeris glabra* L.	*	Y	N	N		N
Asteraceae	*Hypochaeris radicata* L.	*	Y	N	Y		Y
Asteraceae	*Lactuca serriola* L.	*	N	N	N		Y
Asteraceae	*Lactuca virosa* L.	*	N	N	N		Y
Asteraceae	*Lagenophora sublyrata* (Cass.) A.R.Bean & Jian Wang ter	native	Y	Y	N		Y
Asteraceae	*Leontodon saxatilis* Lam.	*	N	N	N		Y
Asteraceae	*Olearia microphylla* (Vent.) Maiden & Betche	native	Y	Y	N		Y
Asteraceae	*Olearia viscidula* (F.Muell.) Benth.	native	N	Y	N		Y
Asteraceae	*Ozothamnus diosmifolius* (Vent.) DC.	native	Y	Y	N		Y
Asteraceae	*Picris angustifolia* DC. subsp. *angustifolia*	native	Y	N	N		N
Asteraceae	*Pseudognaphalium luteoalbum* (L.) Hilliard & B.L.Burtt	native	Y	Y	N		Y
Asteraceae	*Senecio bathurstianus* (DC.) Sch.Bip.	native	N	Y	N		N
Asteraceae	*Senecio hispidulus* A.Rich.	native	Y	Y	N		Y
Asteraceae	*Senecio linearifolius* A.Rich.	native	Y	Y	N		N
Asteraceae	*Senecio madagascariensis* Poir.	*	Y	N	Y		Y
Asteraceae	*Senecio pinnatifolius* A.Rich.	native	N	N	N		Y
Asteraceae	*Senecio quadridentatus* Labill.	native	Y	Y	N		N
Asteraceae	*Senecio* sp.	*	N	N	Y		N
Asteraceae	*Sigesbeckia orientalis* L.	native	N	N	N		Y
Asteraceae	*Silybum marianum* (L.) Gaertn.	*	Y	N	N		N
Asteraceae	*Solenogyne bellioides* Cass.	native	Y	Y	N		Y
Asteraceae	*Solenogyne dominii* L.G.Adams	native	N	N	N		Y
Asteraceae	*Soliva anthemifolia* (Juss.) Sweet	*	Y	N	N		N
Asteraceae	*Soliva sessilis* Ruiz & Pav.	*	Y	N	N		Y
Asteraceae	*Sonchus asper* (L.) Hill	*	Y	N	N		Y
Asteraceae	*Sonchus oleraceus* L.	*	Y	N	Y		Y
Asteraceae	*Sphaeromorphaea australis* (Less.) Kitam.	native	N	N	N	Y	N

Family	Species	Origin *=non native	Price 1979	Price 1988	Rawling Neff 1990	Gibson 1992	Mesaglio 2024
Asteraceae	*Symphyotrichum subulatum* (Michx.) G.L.Nesom	*	Y	N	Y		Y
Asteraceae	*Taraxacum officinale* F.H.Wigg.	*	N	N	Y		Y
Asteraceae	*Tragopogon porrifolius* L.	*	Y	N	N		N
Asteraceae	*Triptilodiscus pygmaeus* Turcz.	native	Y	Y	N		Y
Asteraceae	*Urospermum picroides* (L.) Scop. ex F.W.Schmidt	*	N	N	N		Y
Asteraceae	*Vittadinia cuneata* DC. var. *cuneata*	native	N	Y	N		Y
Asteraceae	*Vittadinia muelleri* N.T.Burb.	native	Y	Y	N		N
Asteraceae	*Vittadinia sulcata* N.T.Burb.	native	N	N	N		Y
Basellaceae	*Anredera cordifolia* (Ten.) Steenis	*	Y	N	Y		Y
Berberidaceae	*Nandina domestica* Thunb.	*	N	N	N		Y
Bignoniaceae	*Campsis grandiflora* (Thunb.)	*	N	N	Y		N
Bignoniaceae	*Campsis* x *tagliabuana* (Vis.) Rehder	*	Y	N	N		N
Bignoniaceae	*Dolichandra unguis-cati* (L.) L.G.Lohmann	*	N	N	N		Y
Bignoniaceae	*Jacaranda mimosifolia* D.Don	*	N	N	N		Y
Bignoniaceae	*Pandorea pandorana* (Andrews) Steenis	native	Y	Y	N		Y
Bignoniaceae	*Tecoma stans* (L.) Juss. ex Kunth	*	N	N	N		Y
Blechnaceae	*Blechnum rupestre* (Kaulf. ex Link) Christenh.	native	N	N	N		Y
Boraginaceae	*Myosotis sylvatica* Hoffm.	*	Y	N	N		N
Brassicaceae	*Brassica* × *juncea* (L.) Czern.	*	Y	N	N		N
Brassicaceae	*Brassica fruticulosa* Cirillo	*	Y	N	N		Y
Brassicaceae	*Brassica oleracea* L.	*	N	N	N		Y
Brassicaceae	*Brassica rapa* L.	*	Y	N	Y		Y
Brassicaceae	*Capsella bursa-pastoris* (L.) Medik.	*	Y	N	N		Y
Brassicaceae	*Cardamine hirsuta* L.	*	N	N	N		Y
Brassicaceae	*Cardamine lilacina* Hook.	native	Y	N	N		N
Brassicaceae	*Cardamine paucijuga* Turcz.	native	N	N	N		Y
Brassicaceae	*Cardamine microthrix* I.Thomps.	native	N	N	N		Y
Brassicaceae	*Lepidium africanum* (Burm.f.) DC.	*	N	N	N		Y
Brassicaceae	*Lepidium bonariense* L.	*	Y	N	N		Y
Brassicaceae	*Lepidium didymum* L.	*	Y	N	Y		Y
Brassicaceae	*Lobularia maritima* (L.) Desv.	*	Y	N	N		N
Brassicaceae	*Raphanus raphanistrum* L.	*	N	N	N		Y
Brassicaceae	*Rorippa nasturtium-aquaticum* (L.) Hayek	*	Y	N	Y		Y
Brassicaceae	*Sisymbrium officinale* (L.) Scop.	*	Y	N	N		N
Brassicaceae	*Sisymbrium orientale* L.	*	Y	N	N		N
Cactaceae	*Cereus* sp.	planted	N	N	N		Planted
Cactaceae	*Opuntia monacantha* Haw.	*	N	N	N		Y
Cactaceae	*Opuntia stricta* (Haw.) Haw.	*	Y	N	Y		N
Cactaceae	*Selenicereus undatus* (Haw.) D.R.Hunt	planted	N	N	N		Planted
Campanulaceae	*Isotoma fluviatilis* (R.Br.) F.Muell. ex Benth. subsp. *fluviatilis*	native	Y	Y	N		N
Campanulaceae	*Lobelia anceps* L.f.	native	Y	N	N		Y
Campanulaceae	*Lobelia purpurascens* R.Br.	native	N	Y	N		Y
Campanulaceae	*Wahlenbergia capillaris* (G.Lodd.) G.Don	native	Y	Y	N		N
Campanulaceae	*Wahlenbergia gracilis* (G.Forst.) A.DC.	native	Y	Y	N		Y
Campanulaceae	*Wahlenbergia stricta* (R.Br.) Sweet	native	Y	Y	N		N
Cannabaceae	*Trema tomentosa* var. *aspera* (Brongn.) Hewson	native	N	N	N		Y
Cannaceae	*Canna indica* L.	*	Y	N	Y		Y
Cannaceae	*Canna* sp.	*	Y	N	N		N
Caprifoliaceae	*Abelia* × *grandiflora* (Rovelli ex André) Rehder	*	Y	N	N		N

Family	Species	Origin *=non native	Price 1979	Price 1988	Rawling Neff 1990	Gibson 1992	Mesaglio 2024
Caprifoliaceae	*Centranthus ruber* (L.) DC.	*	Y	N	N		N
Caprifoliaceae	*Lonicera japonica* Thunb.	*	Y	N	Y		Y
Caryophyllaceae	*Cerastium glomeratum* Thuill.	*	Y	N	Y		Y
Caryophyllaceae	*Paronychia brasiliana* DC.	*	N	N	N		Y
Caryophyllaceae	*Petrorhagia dubia* (Raf.) G.Lopez & Romo	*	Y	N	N		Y
Caryophyllaceae	*Petrorhagia nanteuilii* (Burnat) P.W.Ball & Heywood	*	Y	N	N		Y
Caryophyllaceae	*Polycarpon tetraphyllum* (L.) L.	*	Y	N	N		Y
Caryophyllaceae	*Sagina procumbens* L.	*	N	N	N		Y
Caryophyllaceae	*Silene gallica* L. var. *gallica*	*	Y	N	Y		Y
Caryophyllaceae	*Spergularia levis* Cambess.	*	N	N	N		Y
Caryophyllaceae	*Spergularia rubra* (L.) J.Presl & C.Presl	*	Y	N	N		N
Caryophyllaceae	*Stellaria media* (L.) Vill.	*	Y	N	N		Y
Casuarinaceae	*Allocasuarina littoralis* (Salisb.) L.A.S.Johnson	native	N	N	N		Y
Casuarinaceae	*Allocasuarina torulosa* (Aiton) L.A.S.Johnson	native	Y	Y	N		Y
Casuarinaceae	*Casuarina cunninghamiana* Miq.	native	N	N	N		Y
Casuarinaceae	*Casuarina glauca* Sieber ex Spreng.	native	Y	Y	N		Y
Celastraceae	*Denhamia silvestris* (Lander & L.A.S.Johnson) M.P.Simmons	native	Y	Y	N		Y
Celastraceae	*Stackhousia muricata* Lindl.	native	Y	Y	N		Y
Chenopodiaceae	*Atriplex prostrata* Boucher ex DC.	*	N	N	N		Y
Chenopodiaceae	*Beta vulgaris* L.	*	N	N	N		Y
Chenopodiaceae	*Chenopodium album* L.	*	Y	N	Y		Y
Chenopodiaceae	*Dysphania carinata* (R.Br.) Mosyakin & Clemants	native	N	N	N		Y
Chenopodiaceae	*Dysphania littoralis* R.Br.	native	Y	Y	N		N
Chenopodiaceae	*Dysphania pumilio* (R.Br.) Mosyakin & Clemants	native	N	N	N		Y
Chenopodiaceae	*Einadia hastata* (R.Br.) A.J.Scott	native	Y	Y	N		Y
Chenopodiaceae	*Einadia nutans* (R.Br.) A.J.Scott subsp. *nutans*	native	Y	Y	N		N
Chenopodiaceae	*Einadia polygonoides* (Murr) Paul G.Wilson	native	Y	Y	N		Y
Chenopodiaceae	*Einadia trigonos* (Schult.) Paul G.Wilson	native	Y	Y	N		Y
Chenopodiaceae	*Maireana microphylla* (Moq.) Paul G.Wilson	native	N	Y	N		N
Commelinaceae	*Commelina cyanea* R.Br.	native	N	Y	N		Y
Commelinaceae	*Tradescantia fluminensis* Vell.	*	Y	N	Y		Y
Commelinaceae	*Tradescantia pallida* (Rose) D.R.Hunt	planted	N	N	N		Planted
Convolvulaceae	*Convolvulus erubescens* Sims	native	N	N	N		Y
Convolvulaceae	*Convolvulus farinosus* L.	*	N	N	N		Y
Convolvulaceae	*Dichondra repens* J.R.Forst. & G.Forst.	native	Y	Y	N		Y
Convolvulaceae	*Ipomoea indica* (Burm.) Merr.	*	Y	N	Y		Y
Convolvulaceae	*Ipomoea purpurea* (L.) Roth	*	N	N	N		Y
Convolvulaceae	*Polymeria calycina* R.Br.	native	Y	Y	N		Y
Crassulaceae	*Bryophyllum delagoense* (Eckl. & Zeyh.) Schinz	*	Y	N	N		Y
Crassulaceae	*Bryophyllum fedtschenkoi* (Raym.-Hamet & H.Perrier) Lauz.-March.	planted	N	N	N		Planted
Crassulaceae	*Bryophyllum pinnatum* (Lam.) Oken	*	N	N	N		Y
Crassulaceae	*Crassula multicava* Lem.	*	Y	N	Y		Y
Crassulaceae	*Crassula peduncularis* (Sm.) F.Meigen	native	N	N	N		Y
Crassulaceae	*Crassula sieberiana* (Schult. & Schult.f.) Druce	native	N	Y	N		Y
Crassulaceae	*Sedum praealtum* A.DC.	*	Y	N	N		Planted
Cupressaceae	*Hesperocyparis lusitanica* (Mill.) Bartel	*	N	N	N		Y
Cyatheaceae	*Cyathea cooperi* (Hook. Ex F.Muell.) Domin	native	N	N	N		Y
Cyperaceae	*Bolboschoenus caldwellii* (V.J.Cook) Soják	native	N	N	N	Y	N

Family	Species	Origin *=non native	Price 1979	Price 1988	Rawling Neff 1990	Gibson 1992	Mesaglio 2024
Cyperaceae	*Carex breviculmis* R.Br.	native	N	N	N		Y
Cyperaceae	*Carex inversa* R.Br.	native	Y	Y	N		Y
Cyperaceae	*Carex appressa* R.Br.	native	N	N	N		Y
Cyperaceae	*Cyperus brevifolius* (Rottb.) Endl. ex Hassk.	*	Y	N	N		N
Cyperaceae	*Cyperus eragrostis* Lam.	*	Y	N	Y		Y
Cyperaceae	*Cyperus gracilis* R.Br.	native	N	N	N		Y
Cyperaceae	*Cyperus involucratus* Rottb.	*	N	N	N		Y
Cyperaceae	*Cyperus mirus* C.B.Clarke	native	Y	Y	N		N
Cyperaceae	*Cyperus polystachyos* Rottb.	native	N	Y	N		N
Cyperaceae	*Eleocharis acuta* R.Br.	native	N	N	N	Y	N
Cyperaceae	*Ficinia nodosa* (Rottb.) Goetgh., Muasya & D.A.Simpson	native	N	N	N		Y
Cyperaceae	*Fimbristylis dichotoma* (L.) Vahl	native	N	N	N		Y
Cyperaceae	*Gahnia aspera* (R.Br.) Spreng.	native	Y	Y	N		Y
Cyperaceae	*Gahnia melanocarpa* R.Br.	native	Y	Y	N		Y
Cyperaceae	*Isolepis cernua* (Vahl) Roem. & Schult.	native	N	N	N	Y	Y
Cyperaceae	*Isolepis sepulcralis* Steud.	*	N	N	Y		N
Cyperaceae	*Lepidosperma laterale* R.Br.	native	Y	Y	N		Y
Cyperaceae	*Lepidosperma lineare* R.Br.	native	N	Y	N		N
Cyperaceae	*Machaerina juncea* (R.Br.) T.Koyama	native	N	N	N		Y
Cyperaceae	*Schoenoplectus tabernaemontani* (C.C.Gmel.) Palla	native	N	N	N		Y
Cyperaceae	*Schoenus apogon* Roem. & Schult.	native	N	N	N	Y	Y
Dennstaedtiaceae	*Pteridium esculentum* (G.Forst.) Cockayne	native	Y	Y	N		Y
Didiereaceae	*Portulacaria afra* Jacq.	planted	N	N	N		Planted
Dilleniaceae	*Hibbertia aspera* DC. subsp. *aspera*	native	Y	Y	N		Y
Dilleniaceae	*Hibbertia diffusa* R.Br. ex DC.	native	Y	Y	N		Y
Dilleniaceae	*Hibbertia pedunculata* R.Br. ex DC.	native	Y	Y	N		Y
Droseraceae	*Drosera lunata* Buch.-Ham. ex DC.	native	N	N	N		Y
Droseraceae	*Drosera peltata* Thunb.	native	Y	Y	N		Y
Elatinaceae	*Elatine gratioloides* A.Cunn.	native	N	N	N		Y
Ericaceae	*Astroloma humifusum* (Cav.) R.Br.	native	Y	Y	N		N
Ericaceae	*Leucopogon affinis* R.Br.	native	Y	Y	N		Y
Ericaceae	*Leucopogon juniperinus* R.Br.	native	Y	Y	N		Y
Ericaceae	*Lissanthe strigosa* (Sm.) R.Br.	native	Y	Y	N		Y
Euphorbiaceae	*Acalypha australis* L.	*	N	N	N		Y
Euphorbiaceae	*Euphorbia drummondii* Boiss.	native	Y	N	N		N
Euphorbiaceae	*Euphorbia maculata* L.	*	N	N	N		Y
Euphorbiaceae	*Euphorbia peplus* L.	*	Y	N	Y		Y
Euphorbiaceae	*Euphorbia prostrata* Aiton	*	Y	N	N		Y
Euphorbiaceae	*Euphorbia serpens* Kunth	*	N	N	N		Y
Euphorbiaceae	*Homalanthus populifolius* Graham	native	Y	Y	N		Y
Euphorbiaceae	*Ricinus communis* L.	*	Y	N	Y		Y
Fabaceae	*Acacia baileyana* F.Muell.	*	Y	N	Y		Y
Fabaceae	*Acacia binervia* (J.C.Wendl.) J.F.Macbr.	native	Y	Y	N		Y
Fabaceae	*Acacia brownii* (Poir.) Steud.	native	Y	Y	N		Y
Fabaceae	*Acacia decurrens* Willd.	native	Y	Y	N		Y
Fabaceae	*Acacia falcata* Willd.	native	Y	Y	N		Y
Fabaceae	*Acacia fimbriata* A.Cunn. ex G.Don	native	N	N	N		Y
Fabaceae	*Acacia implexa* Benth.	native	N	N	N		Y
Fabaceae	*Acacia longifolia* (Andrews) Willd. subsp. *longifolia*	native	Y	Y	N		Y

Family	Species	Origin *=non native	Price 1979	Price 1988	Rawling Neff 1990	Gibson 1992	Mesaglio 2024
Fabaceae	*Acacia longissima* H.L.Wendl.	native	N	N	N		Y
Fabaceae	*Acacia parramattensis* Tindale	native	Y	Y	N		Y
Fabaceae	*Acacia podalyriifolia* A.Cunn. ex G.Don	*	N	N	N		Y
Fabaceae	*Acacia pubescens* (Vent.) R.Br.	native	Y	Y	N		Y
Fabaceae	*Acacia stricta* (Andrews) Willd.	native	Y	Y	N		N
Fabaceae	*Acacia ulicifolia* (Salisb.) Court	native	Y	Y	N		Y
Fabaceae	*Bossiaea buxifolia* A.Cunn.	native	Y	Y	N		Y
Fabaceae	*Bossiaea prostrata* R.Br.	native	Y	Y	N		Y
Fabaceae	*Chorizema parviflorum* Benth.	native	Y	Y	N		Y
Fabaceae	*Daviesia ulicifolia* Andrews subsp. *ulicifolia*; *Daviesia ulicifolia* subsp. *stenophylla* G.Chandler & Crisp	native	Y	Y	N		Y
Fabaceae	*Desmodium rhytidophyllum* F.Muell. ex Benth.	native	N	Y	N		Y
Fabaceae	*Desmodium varians* (Labill.) G.Don	native	Y	Y	N		Y
Fabaceae	*Dillwynia sieberi* Steud.	native	Y	Y	N		Y
Fabaceae	*Dipogon lignosus* (L.) Verdc.	*	Y	N	Y		N
Fabaceae	*Erythrina crista-galli* L.	*	Y	N	N		Y
Fabaceae	*Genista monspessulana* (L.) L.A.S.Johnson	*	Y	N	Y		Y
Fabaceae	*Glycine clandestina* J.C.Wendl.	native	Y	Y	N		Y
Fabaceae	*Glycine microphylla* (Benth.) Tindale	native	N	N	N	Y	Y
Fabaceae	*Glycine tabacina* (Labill.) Benth.	native	Y	Y	N		Y
Fabaceae	*Gompholobium glabratum* DC.	native	Y	Y	N		N
Fabaceae	*Hardenbergia violacea* (Schneev.) Stearn	native	Y	Y	N		Y
Fabaceae	*Hovea linearis* (Sm.) R.Br.	native	Y	Y	N		Y
Fabaceae	*Indigofera australis* Willd.	native	Y	Y	N		Y
Fabaceae	*Jacksonia scoparia* R.Br.	native	Y	Y	N		Y
Fabaceae	*Kennedia rubicunda* (Schneev.) Vent.	native	Y	Y	N		Y
Fabaceae	*Lotus angustissimus* L.	*	Y	N	Y		Y
Fabaceae	*Lotus subbiflorus* Lag.	*	N	N	N		Y
Fabaceae	*Medicago lupulina* L.	*	N	N	N		Y
Fabaceae	*Medicago polymorpha* L.	*	Y	N	N		Y
Fabaceae	*Medicago sativa* L.	*	Y	N	N		N
Fabaceae	*Melilotus indicus* (L.) All.	*	Y	N	N		Y
Fabaceae	*Pullenia gunnii* (Benth. ex Hook.f.) H.Ohashi & K.Ohashi	native	N	N	N		Y
Fabaceae	*Pultenaea retusa* Sm.	native	Y	Y	N		N
Fabaceae	*Pultenaea villosa* Willd.	native	Y	Y	N		Y
Fabaceae	*Senna pendula* var. *glabrata* (Vogel) H.S.Irwin & Barneby	*	Y	N	N		Y
Fabaceae	*Trifolium arvense* L.	*	Y	N	Y		N
Fabaceae	*Trifolium campestre* Schreb.	*	Y	N	N		Y
Fabaceae	*Trifolium dubium* Sibth.	*	Y	N	N		Y
Fabaceae	*Trifolium glomeratum* L.	*	Y	N	N		Y
Fabaceae	*Trifolium pratense* L.	*	Y	N	N		N
Fabaceae	*Trifolium repens* L.	*	Y	N	Y		Y
Fabaceae	*Vicia hirsuta* (L.) Gray	*	Y	N	N		Y
Fabaceae	*Vicia sativa* L. subsp. *sativa*; *Vicia sativa* subsp. *nigra* (L.) Ehrh.	*	Y	N	N		Y
Fabaceae	*Vicia tetrasperma* (L.) Schreb.	*	Y	N	N		Y
Fabaceae	*Zornia dyctiocarpa* DC.	native	Y	Y	N		Y

Family	Species	Origin *=non native	Price 1979	Price 1988	Rawling Neff 1990	Gibson 1992	Mesaglio 2024
Gentianaceae	*Centaurium erythraea* Rafn	*	Y	N	N		Y
Gentianaceae	*Centaurium tenuiflorum* (Hoffmanns. & Link) Fritsch	*	Y	N	N		Y
Geraniaceae	*Geranium homeanum* Turcz.	native	N	N	N		Y
Geraniaceae	*Geranium solanderi* Carolin	native	N	Y	N		Y
Geraniaceae	*Pelargonium* × *domesticum* L.H.Bailey	*	Y	N	N		N
Geraniaceae	*Pelargonium inodorum* Willd.	native	Y	Y	N		Y
Goodeniaceae	*Goodenia bellidifolia* Sm. subsp. *bellidifolia*	native	Y	Y	N		N
Goodeniaceae	*Goodenia hederacea* Sm.	native	Y	Y	N		Y
Goodeniaceae	*Goodenia ovata* Sm.	native	Y	Y	N		N
Goodeniaceae	*Goodenia paniculata* Sm.	native	Y	Y	N		Y
Goodeniaceae	*Scaevola albida* (Sm.) Druce	native	Y	Y	N		Y
Haloragaceae	*Gonocarpus humilis* Orchard	native	N	N	N		Y
Haloragaceae	*Gonocarpus tetragynus* Labill.	native	Y	Y	N		N
Haloragaceae	*Myriophyllum aquaticum* (Vell.) Verdc.	*	N	N	Y		N
Hemerocallidaceae	*Caesia parviflora* R.Br. var. *parviflora*; *Caesia parviflora* var. *vittata* (R.Br.) R.J.F.Hend.	native	Y	Y	N		Y
Hemerocallidaceae	*Dianella brevipedunculata* R.J.F.Hend.	*	N	N	N		Y
Hemerocallidaceae	*Dianella caerulea* Sims	native	Y	Y	N		Y
Hemerocallidaceae	*Dianella longifolia* R.Br. var. *longifolia*	native	N	Y	N		Y
Hemerocallidaceae	*Dianella revoluta* R.Br.	native	Y	Y	N		Y
Hemerocallidaceae	*Phormium cookianum* Le Jol.	*	Y	N	N		N
Hemerocallidaceae	*Tricoryne elatior* R.Br.	native	N	Y	N		N
Hemerocallidaceae	*Tricoryne simplex* R.Br.	native	N	Y	N		N
Hypericaceae	*Hypericum gramineum* G.Forst.	native	Y	Y	N		Y
Hypericaceae	*Hypericum perforatum* L.	*	N	N	Y		N
Hypoxidaceae	*Hypoxis hygrometrica* Labill.	native	Y	Y	N		Y
Iridaceae	*Crocosmia* x *crocosmiiflora* (Lemoine ex É.Morren) N.E.Br.	*	N	N	N		Y
Iridaceae	*Dietes grandiflora* N.E.Br.	*	N	N	N		Y
Iridaceae	*Freesia* sp.	*	Y	N	Y		Y
Iridaceae	*Gladiolus* sp.	*	N	N	Y		N
Iridaceae	*Gladiolus undulatus* L.	*	Y	N	N		Y
Iridaceae	*Iris germanica* L.	*	Y	N	N		N
Iridaceae	*Ixia* sp.	*	N	N	Y		N
Iridaceae	*Romulea rosea* var. *australis* (Ewart) M.P.de Vos	*	Y	N	Y		Y
Iridaceae	*Sisyrinchium micranthum* Cav.	*	Y	N	Y		N
Iridaceae	*Sisyrinchium rosulatum* E.P.Bicknell	*	N	N	N		Y
Iridaceae	*Sparaxis* sp.	*	Y	N	Y		N
Iridaceae	*Watsonia meriana* var. *bulbillifera* (J.W.Mathews & L.Bolus) D.A.Cooke	*	Y	N	Y		Y
Juncaceae	*Juncus articulatus* L.	*	Y	N	N		Y
Juncaceae	*Juncus bufonius* L.	native	Y	Y	N		Y
Juncaceae	*Juncus capitatus* Weigel	*	N	N	Y		N
Juncaceae	*Juncus continuus* L.A.S.Johnson	native	N	N	N	Y	N
Juncaceae	*Juncus homalocaulis* F.Muell. ex Benth.	native	Y	Y	N		N
Juncaceae	*Juncus imbricatus* Laharpe	*	N	N	N		Y
Juncaceae	*Juncus microcephalus* Kunth	*	N	N	N		Y
Juncaceae	*Juncus mollis* L.A.S.Johnson	native	Y	Y	N		N
Juncaceae	*Juncus planifolius* R.Br.	native	Y	Y	N		Y
Juncaceae	*Juncus polyanthemus* Buchenau	native	N	N	N	Y	N

Family	Species	Origin *=non native	Price 1979	Price 1988	Rawling Neff 1990	Gibson 1992	Mesaglio 2024
Juncaceae	*Juncus procerus* E.Mey.	native	Y	N	N		N
Juncaceae	*Juncus remotiflorus* L.A.S.Johnson	native	N	N	N	Y	N
Juncaceae	*Juncus subsecundus* N.A.Wakef.	native	N	N	N	Y	Y
Juncaceae	*Juncus usitatus* L.A.S.Johnson	native	Y	Y	N		Y
Juncaceae	*Juncus vaginatus* R.Br.	native	Y	N	N		N
Juncaginaceae	*Triglochin striata* Ruiz & Pav.	native	N	N	N	Y	Y
Lamiaceae	*Lamium amplexicaule* L.	*	N	N	N		Y
Lamiaceae	*Mentha* × *piperita* L.	*	Y	N	N		N
Lamiaceae	*Mentha diemenica* Spreng.	native	N	Y	N		Y
Lamiaceae	*Plectranthus parviflorus* Willd.	native	N	Y	N		Y
Lamiaceae	*Scutellaria racemosa* Pers.	*	Y	N	Y		Y
Lamiaceae	*Stachys arvensis* (L.) L.	*	Y	N	Y		Y
Lauraceae	*Cassytha glabella* R.Br.	native	N	Y	N		N
Lauraceae	*Cassytha paniculata* R.Br.	native	Y	Y	N		Y
Lauraceae	*Cinnamomum camphora* (L.) J.Presl	*	Y	N	Y		Y
Linaceae	*Linum marginale* A.Cunn.	native	Y	Y	N		Y
Linaceae	*Linum trigynum* L.	*	Y	N	N		Y
Linaceae	*Linum usitatissimum* L.	*	Y	N	N		N
Loganiaceae	*Mitrasacme polymorpha* R.Br.	native	N	Y	N		N
Loranthaceae	*Amyema gaudichaudii* (DC.) Tiegh.	native	Y	Y	N		Y
Loranthaceae	*Amyema miquelii* (Lehm. ex Miq.) Tiegh.	native	N	N	N	Y	Y
Loranthaceae	*Dendrophthoe vitellina* (F.Muell.) Tiegh.	native	Y	Y	N		Y
Loranthaceae	*Muellerina eucalyptoides* (DC.) Barlow	native	Y	Y	N		Y
Lythraceae	*Lagerstroemia indica* L.	*	Y	N	N		N
Lythraceae	*Lagerstroemia speciosa* (L.) Pers.	*	N	N	Y		N
Lythraceae	*Lythrum hyssopifolia* L.	native	Y	N	N		Y
Malvaceae	*Brachychiton acerifolius* (A.Cunn. ex G.Don) F.Muell.	*	N	N	N		Y
Malvaceae	*Brachychiton populneus* (Schott & Endl.) R.Br.	native	Y	Y	N		Y
Malvaceae	*Brachychiton discolor* F.Muell.	*	N	N	N		Y
Malvaceae	*Commersonia dasyphylla* Andrews	native	Y	Y	N		N
Malvaceae	*Hibiscus mutabilis* L.	*	N	N	N		Y
Malvaceae	*Lasiopetalum parviflorum* Rudge	native	Y	Y	N		Y
Malvaceae	*Malva nicaeensis* All.	*	N	N	N		Y
Malvaceae	*Malva parviflora* L.	*	Y	N	Y		Y
Malvaceae	*Modiola caroliniana* (L.) G.Don	*	Y	N	N		Y
Malvaceae	*Pavonia hastata* Cav.	*	N	N	N		Y
Malvaceae	*Sida rhombifolia* L.	*	Y	N	Y		Y
Meliaceae	*Melia azedarach* L.	native	N	N	N		Y
Menispermaceae	*Sarcopetalum harveyanum* F.Muell.	native	N	Y	N		Y
Menyanthaceae	*Nymphoides indica* (L.) Kuntze	*	N	N	Y		N
Moraceae	*Ficus rubiginosa* Desf. ex Vent.	native	N	N	N		Y
Moraceae	*Morus alba* L.	*	Y	N	Y		Y
Moraceae	*Morus nigra* L.	*	Y	N	Y		N
Myrtaceae	*Angophora floribunda* (Sm.) Sweet	native	Y	Y	N		Y
Myrtaceae	*Callistemon linearifolius* (Link) DC.	native	N	Y	N		Y
Myrtaceae	*Callistemon linearis* (Schrad. & J.C.Wendl.) Colvill ex Sweet	native	Y	Y	N		Y
Myrtaceae	*Callistemon pinifolius* (J.C.Wendl.) Sweet	native	Y	Y	N		Y
Myrtaceae	*Callistemon salignus* (Sm.) Colvill ex Sweet	native	Y	Y	N		Y
Myrtaceae	*Callistemon viminalis* (Sol. ex Gaertn.) G.Don	*	N	N	N		Y

Family	Species	Origin *=non native	Price 1979	Price 1988	Rawling Neff 1990	Gibson 1992	Mesaglio 2024
Myrtaceae	*Corymbia citriodora* (Hook.) K.D.Hill & L.A.S.Johnson	*	Y	N	Y		Y
Myrtaceae	*Eucalyptus amplifolia* Naudin subsp. *amplifolia*	native	Y	Y	N		Y
Myrtaceae	*Eucalyptus capitellata* Sm.	native	N	N	N		Y
Myrtaceae	*Eucalyptus eugenioides* Sieber ex Spreng.	native	Y	Y	N		Y
Myrtaceae	*Eucalyptus fibrosa* F.Muell. subsp. *fibrosa*	native	Y	Y	N		Y
Myrtaceae	*Eucalyptus globoidea* Blakely	native	Y	Y	N		Y
Myrtaceae	*Eucalyptus globulus* subsp. *maidenii* (F.Muell.) J.B.Kirkp.; *Eucalyptus globulus* subsp. *pseudoglobulus* (Naudin) J.B.Kirkp.	*	Y	N	Y		N
Myrtaceae	*Eucalyptus grandis* W.Hill	*	N	N	N		Y
Myrtaceae	*Eucalyptus longifolia* Link	native	Y	Y	N		Y
Myrtaceae	*Eucalyptus melliodora* A.Cunn. ex Schauer	*	Y	N	Y		N
Myrtaceae	*Eucalyptus microcorys* F.Muell.	*	Y	N	Y		Y
Myrtaceae	*Eucalyptus moluccana* Roxb.	native	Y	Y	N		Y
Myrtaceae	*Eucalyptus paniculata* Sm.	planted	N	N	N		Planted
Myrtaceae	*Eucalyptus punctata* DC.	native	Y	Y	N		Y
Myrtaceae	*Eucalyptus resinifera* J.White	native	Y	Y	N		Y
Myrtaceae	*Eucalyptus saligna* Sm.	*	Y	N	N		N
Myrtaceae	*Eucalyptus sideroxylon* A.Cunn. ex Woolls subsp. *sideroxylon*	native	Y	N	N		N
Myrtaceae	*Eucalyptus tereticornis* Sm.	native	Y	Y	N		Y
Myrtaceae	*Kunzea ambigua* (Sm.) Druce	native	Y	Y	N		Y
Myrtaceae	*Leptospermum polygalifolium* Salisb. subsp. *polygalifolium*	native	Y	Y	N		Y
Myrtaceae	*Leptospermum trinervium* (J.White) Sm.	native	Y	Y	N		Y
Myrtaceae	*Melaleuca armillaris* (Sol. ex Gaertn.) Sm.	*	Y	N	Y		N
Myrtaceae	*Melaleuca decora* (Salisb.) Britten	native	Y	Y	N		Y
Myrtaceae	*Melaleuca diosmatifolia* Dum.Cours.	native	Y	Y	N		Y
Myrtaceae	*Melaleuca ericifolia* Sm.	*	Y	N	N		N
Myrtaceae	*Melaleuca linariifolia* Sm.	native	Y	Y	N		Y
Myrtaceae	*Melaleuca nodosa* (Sol. ex Gaertn.) Sm.	native	Y	Y	N		Y
Myrtaceae	*Melaleuca styphelioides* Sm.	native	Y	Y	N		Y
Myrtaceae	*Melaleuca thymifolia* Sm.	native	Y	N	N		Y
Myrtaceae	*Syncarpia glomulifera* (Sm.) Nied.	native	Y	N	N		N
Myrtaceae	*Syzygium floribundum* F.Muell.	*	N	N	N		Y
Myrtaceae	*Syzygium oleosum* (F.Muell.) B.Hyland	*	N	N	N		Y
Myrtaceae	*Tristaniopsis laurina* (Sm.) Peter G.Wilson & J.T.Waterh.	*	N	N	N		Y
Nyctaginaceae	*Bougainvillea* sp.	*	Y	N	Y		N
Nyctaginaceae	*Mirabilis jalapa* L.	*	Y	N	N		N
Ochnaceae	*Ochna serrulata* (Hochst.) Walp.	*	Y	N	Y		Y
Oleaceae	*Fraxinus griffithii* C.B.Clarke	*	N	N	N		Y
Oleaceae	*Ligustrum lucidum* W.T.Aiton	*	Y	N	Y		Y
Oleaceae	*Ligustrum sinense* Lour.	*	Y	N	Y		Y
Oleaceae	*Ligustrum vulgare* L.	*	N	N	N		Y
Oleaceae	*Notelaea longifolia* Vent. f. *longifolia*	native	Y	Y	N		Y
Oleaceae	*Notelaea ovata* R.Br.	native	Y	Y	N		Y
Oleaceae	*Olea europaea* subsp. *cuspidata* (Wall. ex G.Don) Cif.	*	N	N	Y		Y

Family	Species	Origin *=non native	Price 1979	Price 1988	Rawling Neff 1990	Gibson 1992	Mesaglio 2024
Onagraceae	*Epilobium billardiereanum* Ser. subsp. *billardiereanum*; *Epilobium billardiereanum* subsp. *cinereum* (A.Rich.) P.H.Raven & Engelhorn	native	N	Y	N		Y
Onagraceae	*Epilobium ciliatum* Raf.	*	N	N	N		Y
Onagraceae	*Ludwigia peruviana* (L.) H.Hara	*	N	N	N		Y
Onagraceae	*Oenothera indecora* Cambess.	*	N	N	N		Y
Orchidaceae	*Dipodium punctatum* (Sm.) R.Br.	native	N	N	N		Y
Orchidaceae	*Diuris maculata* Sm.	native	Y	Y	N		Y
Orchidaceae	*Diuris sulphurea* R.Br.	native	Y	Y	N		N
Orchidaceae	*Microtis* sp.	native	N	N	N	Y	N
Orchidaceae	*Pterostylis nutans* R.Br.	native	Y	Y	N		Y
Orchidaceae	*Pterostylis oblonga* D.L.Jones	native	N	N	N		Y
Orchidaceae	*Pterostylis rufa* R.Br.	native	N	N	N		Y
Orchidaceae	*Thelymitra pauciflora* R.Br.	native	Y	Y	N		N
Oxalidaceae	*Oxalis articulata* Savigny	*	Y	N	N		N
Oxalidaceae	*Oxalis corniculata* L.	*	Y	N	N		Y
Oxalidaceae	*Oxalis debilis* var. *corymbosa* (DC.) Lourteig	*	Y	N	N		Y
Oxalidaceae	*Oxalis latifolia* Kunth	*	Y	N	N		Y
Oxalidaceae	*Oxalis perennans* Haw.	native	N	N	N	Y	Y
Oxalidaceae	*Oxalis pes-caprae* L.	*	Y	N	N		Y
Oxalidaceae	*Oxalis radicosa* A.Rich.	native	N	N	N		Y
Oxalidaceae	*Oxalis thompsoniae* B.J.Conn & P.G.Richards	native	N	N	N	Y	Y
Papaveraceae	*Fumaria bastardii* Boreau	*	N	N	N		Y
Papaveraceae	*Fumaria muralis* Sond. ex W.D.J.Koch subsp. *muralis*	*	Y	N	N		Y
Papaveraceae	*Papaver dubium* L.	*	N	N	N		Y
Papaveraceae	*Papaver hybridum* L.	*	Y	N	Y		N
Papaveraceae	*Papaver somniferum* subsp. *setigerum* (DC.) Arcang.	*	Y	N	Y		Y
Passifloraceae	*Passiflora edulis* Sims	*	N	N	N		Y
Passifloraceae	*Passiflora suberosa* L.	*	N	N	N		Y
Phyllanthaceae	*Breynia oblongifolia* (Müll.Arg.) Müll.Arg.	native	Y	Y	N		Y
Phyllanthaceae	*Glochidion ferdinandi* (Müll.Arg.) F.M.Bailey	native	Y	Y	N		Y
Phyllanthaceae	*Phyllanthus gunnii* Hook.f.	native	Y	Y	N		Y
Phyllanthaceae	*Phyllanthus tenellus* Roxb.	*	N	N	N		Y
Phyllanthaceae	*Poranthera microphylla* Brongn.	native	Y	Y	N		Y
Phytolaccaceae	*Phytolacca octandra* L.	*	Y	N	Y		Y
Pittosporaceae	*Auranticarpa rhombifolia* (A.Cunn. ex Hook.) L.W.Cayzer, Crisp & I.Telford	*	N	N	N		Y
Pittosporaceae	*Billardiera mutabilis* Salisb.	native	N	N	N		Y
Pittosporaceae	*Billardiera scandens* Sm.	native	Y	Y	N		N
Pittosporaceae	*Bursaria spinosa* Cav.	native	Y	Y	N		Y
Pittosporaceae	*Hymenosporum flavum* (Hook.) F.Muell.	*	N	N	N		Y
Pittosporaceae	*Pittosporum multiflorum* (A.Cunn. ex Loudon) L.W.Cayzer, Crisp & I.Telford	native	N	N	N	Y	Y
Pittosporaceae	*Pittosporum revolutum* W.T.Aiton	native	Y	Y	N		Y
Pittosporaceae	*Pittosporum undulatum* Vent.	native	Y	Y	N		Y
Plantaginaceae	*Callitriche stagnalis* Scop.	*	N	N	N		Y
Plantaginaceae	*Gratiola pedunculata* R.Br.	native	N	N	N	Y	Y
Plantaginaceae	*Misopates orontium* (L.) Raf.	*	Y	N	N		Y
Plantaginaceae	*Plantago coronopus* L.	*	N	N	Y		N
Plantaginaceae	*Plantago debilis* R.Br.	native	N	N	N	Y	Y

Family	Species	Origin *=non native	Price 1979	Price 1988	Rawling Neff 1990	Gibson 1992	Mesaglio 2024
Plantaginaceae	*Plantago lanceolata* L.	*	Y	N	Y		Y
Plantaginaceae	*Plantago major* L.	*	N	N	N		Y
Plantaginaceae	*Plantago myosuros* Lam. subsp. *myosuros*	*	N	N	N		Y
Plantaginaceae	*Plantago varia* R.Br.	native	Y	Y	N		N
Plantaginaceae	*Veronica anagallis-aquatica* L.	*	N	N	N		Y
Plantaginaceae	*Veronica arvensis* L.	*	N	N	N		Y
Plantaginaceae	*Veronica calycina* R.Br.	native	N	Y	N		N
Plantaginaceae	*Veronica persica* Poir.	*	Y	N	N		Y
Plantaginaceae	*Veronica plebeia* R.Br.	native	N	Y	N		Y
Platanaceae	*Platanus* × *hispanica* Mill. ex Münchh.	planted	N	N	N		Planted
Poaceae	*Amphibromus neesii* Steud.	native	Y	N	N		N
Poaceae	*Anthosachne scabra* (R.Br.) Nevski	native	N	N	N	Y	Y
Poaceae	*Aristida ramosa* R.Br.	native	Y	Y	N		N
Poaceae	*Aristida vagans* Cav.	native	Y	Y	N		Y
Poaceae	*Austrostipa pubescens* (R.Br.) S.W.L.Jacobs & J.Everett	native	Y	Y	N		N
Poaceae	*Austrostipa rudis* subsp. *australis* (J.Everett & S.W.L.Jacobs) S.W.L.Jacobs & J.Everett; *Austrostipa rudis* subsp. *nervosa* (Vickery) S.W.L.Jacobs & J.Everett; *Austrostipa rudis* (Spreng.) S.W.L.Jacobs & J.Everett subsp. *rudis*	native	Y	Y	N		Y
Poaceae	*Austrostipa scabra* (Lindl.) S.W.L.Jacobs & J.Everett	native	Y	Y	N		N
Poaceae	*Austrostipa setacea* (R.Br.) S.W.L.Jacobs & J.Everett	native	N	N	N	Y	N
Poaceae	*Avena barbata* Pott ex Link	*	Y	N	N		Y
Poaceae	*Avena sterilis* subsp. *ludoviciana* (Durieu) Nyman	*	Y	N	N		N
Poaceae	*Axonopus fissifolius* (Raddi) Kuhlm.	*	Y	N	Y		N
Poaceae	*Bothriochloa decipiens* (Hack.) C.E.Hubb.	native	N	Y	N		N
Poaceae	*Bothriochloa macra* (Steud.) S.T.Blake	native	Y	Y	N		Y
Poaceae	*Briza maxima* L.	*	Y	N	Y		Y
Poaceae	*Briza minor* L.	*	Y	N	Y		Y
Poaceae	*Bromus catharticus* Vahl	*	Y	N	Y		Y
Poaceae	*Bromus diandrus* Roth	*	Y	N	N		N
Poaceae	*Bromus hordeaceus* L.	*	Y	N	N		N
Poaceae	*Bromus rubens* L.	*	Y	N	N		N
Poaceae	*Capillipedium spicigerum* S.T.Blake	native	N	N	N		Y
Poaceae	*Cenchrus clandestinus* (Hochst. ex Chiov.) Morrone	*	Y	N	Y		Y
Poaceae	*Chascolytrum subaristatum* (Lam.) Desv.	*	Y	N	N		Y
Poaceae	*Chloris gayana* Kunth	*	Y	N	Y		Y
Poaceae	*Chloris truncata* R.Br.	native	Y	Y	N		Y
Poaceae	*Chloris ventricosa* R.Br.	native	N	Y	N		Y
Poaceae	*Chloris virgata* Sw.	*	Y	N	N		Y
Poaceae	*Cortaderia selloana* (Schult. & Schult.f.) Asch. & Graebn.	*	Y	N	Y		N
Poaceae	*Cymbopogon refractus* (R.Br.) A.Camus	native	Y	Y	N		Y
Poaceae	*Cynodon dactylon* (L.) Pers.	*	Y	N	Y		Y
Poaceae	*Dactylis glomerata* L.	*	Y	N	Y		N
Poaceae	*Deyeuxia quadriseta* (Labill.) Benth.	native	Y	Y	N		N
Poaceae	*Dichelachne crinita* (L.f.) Hook.f.	native	N	N	N		Y
Poaceae	*Dichelachne micrantha* (Cav.) Domin	native	Y	Y	N		Y
Poaceae	*Dichelachne rara* (R.Br.) Vickery	native	Y	Y	N		N

Family	Species	Origin *=non native	Price 1979	Price 1988	Rawling Neff 1990	Gibson 1992	Mesaglio 2024
Poaceae	*Digitaria ciliaris* (Retz.) Koeler	*	Y	N	N		N
Poaceae	*Digitaria didactyla* Willd.	*	N	N	N		Y
Poaceae	*Digitaria parviflora* (R.Br.) Hughes	native	Y	Y	N		Y
Poaceae	*Digitaria ramularis* (Trin.) Henrard	native	N	Y	N		N
Poaceae	*Digitaria sanguinalis* (L.) Scop.	*	Y	N	N		Y
Poaceae	*Echinochloa crus-galli* (L.) P.Beauv.	*	Y	N	Y		Y
Poaceae	*Echinochloa telmatophila* P.W.Michael & Vickery	native	N	Y	N		N
Poaceae	*Echinopogon caespitosus* C.E.Hubb. var. *caespitosus*	native	Y	Y	N		Y
Poaceae	*Echinopogon ovatus* (G.Forst.) P.Beauv.	native	Y	Y	N		Y
Poaceae	*Ehrharta erecta* Lam.	*	N	N	N		Y
Poaceae	*Ehrharta longiflora* Sm.	*	Y	N	N		Y
Poaceae	*Eleusine indica* (L.) Gaertn.	*	Y	N	Y		N
Poaceae	*Eleusine tristachya* (Lam.) Lam.	*	Y	N	Y		Y
Poaceae	*Entolasia marginata* (R.Br.) Hughes	native	Y	Y	N		Y
Poaceae	*Entolasia stricta* (R.Br.) Hughes	native	Y	Y	N		Y
Poaceae	*Eragrostis benthamii* Mattei	native	Y	Y	N		N
Poaceae	*Eragrostis brownii* (Kunth) Nees	native	Y	Y	N		Y
Poaceae	*Eragrostis curvula* (Schrad.) Nees	*	Y	N	Y		Y
Poaceae	*Eragrostis elongata* (Willd.) J.Jacq.	native	N	Y	N		N
Poaceae	*Eragrostis leptostachya* (R.Br.) Steud.	native	Y	Y	N		Y
Poaceae	*Eragrostis lugens* Nees	*	N	N	N		Y
Poaceae	*Eragrostis parviflora* (R.Br.) Trin.	native	N	Y	N		N
Poaceae	*Eragrostis pilosa* (L.) P.Beauv.	*	N	N	N		Y
Poaceae	*Eragrostis tenuifolia* (A.Rich.) Hochst. ex Steud.	*	N	N	N		Y
Poaceae	*Eriochloa pseudoacrotricha* (Stapf ex Thell.) J.M.Black	native	Y	Y	N		Y
Poaceae	*Imperata cylindrica* (L.) P.Beauv.	native	Y	Y	N		Y
Poaceae	*Lachnagrostis aemula* (R.Br.) Trin.	native	Y	Y	N		N
Poaceae	*Lachnagrostis filiformis* (G.Forst.) Trin.	native	Y	Y	N		Y
Poaceae	*Lolium multiflorum* Lam.	*	Y	N	N		Y
Poaceae	*Lolium perenne* L.	*	Y	N	Y		Y
Poaceae	*Lolium rigidum* Gaudin	*	N	N	N		Y
Poaceae	*Megathyrsus maximus* (Jacq.) B.K.Simon & S.W.L.Jacobs	*	N	N	N		Y
Poaceae	*Melinis repens* (Willd.) Zizka	*	N	N	N		Y
Poaceae	*Microlaena stipoides* (Labill.) R.Br. var. *stipoides*	native	Y	Y	N		Y
Poaceae	*Oplismenus hirtellus* (L.) P.Beauv.	native	Y	Y	N		Y
Poaceae	*Panicum effusum* R.Br.	native	N	Y	N		N
Poaceae	*Panicum simile* Domin	native	N	Y	N		Y
Poaceae	*Paspalidium aversum* Vickery	native	Y	Y	N		N
Poaceae	*Paspalidium criniforme* S.T.Blake	native	N	Y	N		Y
Poaceae	*Paspalidium distans* (Trin.) Hughes	native	N	Y	N		Y
Poaceae	*Paspalidium gracile* (R.Br.) Hughes	native	N	N	N		Y
Poaceae	*Paspalum dilatatum* Poir.	*	Y	N	Y		Y
Poaceae	*Paspalum quadrifarium* Lam.	*	Y	N	Y		Y
Poaceae	*Paspalum urvillei* Steud.	*	N	N	N		Y
Poaceae	*Paspalum vaginatum* Sw.	native	N	Y	N		N
Poaceae	*Phalaris aquatica* L.	*	Y	N	N		Y
Poaceae	*Phalaris minor* Retz.	*	Y	N	N		N
Poaceae	*Phragmites australis* (Cav.) Trin. ex Steud.	native	Y	Y	N		Y

Family	Species	Origin *=non native	Price 1979	Price 1988	Rawling Neff 1990	Gibson 1992	Mesaglio 2024
Poaceae	*Poa affinis* R.Br.	native	Y	Y	N		N
Poaceae	*Poa annua* L.	*	Y	N	Y		Y
Poaceae	*Poa labillardierei* Steud. var. *labillardierei*	native	N	Y	N		N
Poaceae	*Poa pratensis* L.	*	Y	N	N		N
Poaceae	*Poa sieberiana* Spreng. var. *sieberiana*	native	Y	Y	N		Y
Poaceae	*Polypogon lutosus* (Poir.) Hitchc.	*	N	N	N		Y
Poaceae	*Polypogon monspeliensis* (L.) Desf.	*	Y	N	N		N
Poaceae	*Polypogon viridis* (Gouan) Breistr.	*	N	N	N		Y
Poaceae	*Rytidosperma bipartitum* (Link) A.M.Humphreys & H.P.Linder	native	N	Y	N		N
Poaceae	*Rytidosperma erianthum* (Lindl.) Connor & Edgar	native	N	N	N		Y
Poaceae	*Rytidosperma fulvum* (Vickery) A.M.Humphreys & H.P.Linder	native	N	Y	N		Y
Poaceae	*Rytidosperma longifolium* (R.Br.) Connor & Edgar	native	Y	Y	N		N
Poaceae	*Rytidosperma pallidum* (R.Br.) A.M.Humphreys & H.P.Linder	native	N	N	N		Y
Poaceae	*Rytidosperma racemosum* (R.Br.) Connor & Edgar	native	Y	Y	N		N
Poaceae	*Rytidosperma setaceum* (R.Br.) Connor & Edgar	native	Y	Y	N		Y
Poaceae	*Rytidosperma tenuius* (Steud.) A.Hansen & Sunding	native	Y	Y	N		Y
Poaceae	*Setaria palmifolia* (J.Koenig) Stapf	*	Y	N	Y		N
Poaceae	*Setaria parviflora* (Poir.) Kerguelen	*	Y	N	Y		Y
Poaceae	*Setaria pumila* (Poir.) Roem. & Schult.	*	Y	N	Y		Y
Poaceae	*Sorghum halepense* (L.) Pers.	*	Y	N	Y		Y
Poaceae	*Sorghum leiocladum* (Hack.) C.E.Hubb.	*	Y	N	N		N
Poaceae	*Sporobolus africanus* (Poir.) Robyns & Tournay	*	Y	N	Y		Y
Poaceae	*Sporobolus creber* De Nardi	native	N	N	N		Y
Poaceae	*Sporobolus elongatus* R.Br.	native	Y	Y	N		N
Poaceae	*Sporobolus fertilis* (Steud.) Clayton	*	N	N	N		Y
Poaceae	*Stenotaphrum secundatum* (Walter) Kuntze	*	Y	N	Y		Y
Poaceae	*Themeda triandra* Forssk.	native	Y	Y	N		Y
Poaceae	*Triticum aestivum* L.	*	Y	N	N		N
Poaceae	*Urochloa foliosa* (R.Br.) R.D.Webster	native	Y	Y	N		N
Poaceae	*Vulpia bromoides* (L.) Gray	*	Y	N	Y		Y
Poaceae	*Vulpia muralis* (Kunth) Nees	*	N	N	N		Y
Poaceae	*Vulpia myuros* (L.) C.C.Gmel.	*	Y	N	Y		Y
Polygalaceae	*Polygala japonica* Houtt.	native	N	N	N	Y	N
Polygalaceae	*Polygala virgata* Thunb.	*	N	N	N		Y
Polygonaceae	*Persicaria decipiens* (R.Br.) K.L.Wilson	native	Y	Y	N		Y
Polygonaceae	*Persicaria lapathifolia* (L.) Delarbre	native	Y	Y	N		Y
Polygonaceae	*Polygonum aviculare* L.	*	Y	N	Y		Y
Polygonaceae	*Rumex brownii* Campd.	native	Y	Y	N		Y
Polygonaceae	*Rumex conglomeratus* Murray	*	Y	N	N		Y
Polygonaceae	*Rumex crispus* L.	*	Y	N	Y		Y
Polygonaceae	*Rumex sagittatus* Thunb.	*	N	N	N		Y
Pontederiaceae	*Pontederia crassipes* Mart.	*	N	N	Y		N
Portulacaceae	*Portulaca oleracea* L.	native	Y	Y	N		Y
Portulacaceae	*Portulaca* sp.	*	N	N	Y		N
Potamogetonaceae	*Potamogeton crispus* L.	native	N	N	N		Y

Family	Species	Origin *=non native	Price 1979	Price 1988	Rawling Neff 1990	Gibson 1992	Mesaglio 2024
Primulaceae	*Lysimachia arvensis* (L.) U.Manns & Anderb. var. *arvensis*; *Lysimachia arvensis* var. *caerulea* (L.) Turland & Bergmeier	*	Y	N	Y		Y
Primulaceae	*Myrsine variabilis* R.Br.	native	Y	Y	N		Y
Primulaceae	*Primula malacoides* Franch.	*	Y	N	N		N
Proteaceae	*Grevillea robusta* A.Cunn. ex R.Br.	*	N	N	N		Y
Proteaceae	*Hakea sericea* Schrad. & J.C.Wendl.	native	Y	Y	N		Y
Proteaceae	*Macadamia integrifolia* Maiden & Betche	*	N	N	N		Y
Proteaceae	*Persoonia linearis* Andrews	native	Y	Y	N		Y
Pteridaceae	*Adiantum aethiopicum* L.	native	Y	Y	N		Y
Pteridaceae	*Cheilanthes distans* (R.Br.) Mett.	native	N	N	N		Y
Pteridaceae	*Cheilanthes sieberi* Kunze subsp. *sieberi*	native	Y	Y	N		Y
Pteridaceae	*Pellaea falcata* (R.Br.) Fée	native	Y	Y	N		Y
Pteridaceae	*Pellaea viridis* (Forssk.) Prantl	*	N	N	N		Y
Pteridaceae	*Pteris tremula* R.Br.	native	N	N	N		Y
Pteridaceae	*Pteris vittata* L.	native	N	N	N		Y
Ranunculaceae	*Clematis aristata* R.Br. ex Ker Gawl.	native	Y	Y	N		Y
Ranunculaceae	*Clematis glycinoides* DC.	native	Y	Y	N		Y
Ranunculaceae	*Ranunculus lappaceus* Sm.	native	Y	Y	N		N
Ranunculaceae	*Ranunculus repens* L.	*	N	N	Y		N
Ranunculaceae	*Ranunculus sceleratus* L.	*	N	N	N		Y
Rhamnaceae	*Pomaderris discolor* (Vent.) Poir.	native	N	N	N		Y
Rhamnaceae	*Pomaderris ferruginea* Sieber ex Fenzl	native	Y	Y	N		Y
Rhamnaceae	*Pomaderris lanigera* (Andrews) Sims	native	Y	Y	N		N
Rhamnaceae	*Rhamnus alaternus* L.	*	N	N	N		Y
Rosaceae	*Cotoneaster glaucophyllus* Franch.	*	Y	N	Y		Y
Rosaceae	*Photinia glabra* (Thunb.) Franch. & Sav.	*	Y	N	Y		N
Rosaceae	*Potentilla indica* (Andrews) Th.Wolf	*	N	N	N		Y
Rosaceae	*Prunus domestica* L.	*	Y	N	N		N
Rosaceae	*Prunus persica* (L.) Batsch	*	Y	N	N		N
Rosaceae	*Pyracantha crenulata* (D.Don) M.Roem.	*	N	N	N		Y
Rosaceae	*Rosa* sp.	*	Y	N	N		N
Rosaceae	*Rubus anglocandicans* A.Newton	*	N	N	N		Y
Rosaceae	*Rubus laciniatus* Willd.	*	Y	N	Y		N
Rosaceae	*Rubus parvifolius* L.	native	N	Y	N		Y
Rosaceae	*Spiraea cantoniensis* Lour.	*	Y	N	N		N
Rubiaceae	*Asperula conferta* Hook.f.	native	N	Y	N		Y
Rubiaceae	*Galium aparine* L.	*	N	N	N		Y
Rubiaceae	*Galium leiocarpum* I.Thomps.	native	N	N	N		Y
Rubiaceae	*Opercularia aspera* Gaertn.	native	Y	Y	N		N
Rubiaceae	*Opercularia diphylla* Gaertn.	native	Y	Y	N		Y
Rubiaceae	*Opercularia varia* Hook.f.	native	Y	Y	N		Y
Rubiaceae	*Richardia stellaris* (Cham. & Schltdl.) Steud.	*	Y	N	N		Y
Rubiaceae	*Rothmannia globosa* (Hochst.) Keay	*	N	N	N		Y
Rutaceae	*Asterolasia correifolia* (A.Juss.) Benth.	native	Y	Y	N		N
Rutaceae	*Boronia polygalifolia* Sm.	native	Y	Y	N		Y
Rutaceae	*Correa reflexa* (Labill.) Vent.	native	Y	Y	N		Y
Rutaceae	*Murraya paniculata* (L.) Jack	*	N	N	N		Y
Rutaceae	*Zieria smithii* Andrews	native	Y	Y	N		Y

Family	Species	Origin *=non native	Price 1979	Price 1988	Rawling Neff 1990	Gibson 1992	Mesaglio 2024
Salicaceae	*Salix babylonica* L.	*	Y	N	Y		Y
Santalaceae	*Exocarpos cupressiformis* Labill.	native	Y	Y	N		Y
Santalaceae	*Exocarpos strictus* R.Br.	native	Y	Y	N		N
Santalaceae	*Omphacomeria acerba* (R.Br.) A.DC.	native	N	Y	N		N
Sapindaceae	*Acer negundo* L.	*	N	N	N		Y
Sapindaceae	*Cardiospermum grandiflorum* Sw.	*	Y	N	Y		Y
Sapindaceae	*Cupaniopsis anacardioides* (A.Rich.) Radlk.	*	N	N	N		Y
Sapindaceae	*Dodonaea triquetra* J.C.Wendl.	native	Y	Y	N		Y
Scrophulariaceae	*Eremophila debilis* (Andrews) Chinnock	native	Y	Y	N		Y
Scrophulariaceae	*Myoporum boninense* subsp. *australe* Chinnock	native	Y	Y	N		Y
Scrophulariaceae	*Verbascum virgatum* Stokes	*	N	N	N		Y
Solanaceae	*Capsicum annuum* L.	*	N	N	N		Y
Solanaceae	*Cestrum aurantiacum* Lindl.	*	Y	N	N		Y
Solanaceae	*Cestrum parqui* L'Hér.	*	Y	N	Y		Y
Solanaceae	*Lycium ferocissimum* Miers	*	Y	N	N		N
Solanaceae	*Solanum americanum* Mill.	*	Y	N	N		Y
Solanaceae	*Solanum chenopodioides* Lam.	*	N	N	N		Y
Solanaceae	*Solanum linnaeanum* Hepper & P.-M.L.Jaeger	*	Y	N	N		N
Solanaceae	*Solanum lycopersicum* L.	*	N	N	N		Y
Solanaceae	*Solanum mauritianum* Scop.	*	Y	N	Y		Y
Solanaceae	*Solanum nigrum* L.	*	Y	N	Y		Y
Solanaceae	*Solanum pseudocapsicum* L.	*	Y	N	Y		Y
Solanaceae	*Solanum seaforthianum* Andrews	*	N	N	N		Y
Strelitziaceae	*Strelitzia reginae* Banks	planted	N	N	N		Planted
Thelypteridaceae	*Christella dentata* (Forssk.) Brownsey & Jermy	native	N	N	N		Y
Thymelaeaceae	*Pimelea linifolia* Sm.	native	Y	Y	N		Y
Tropaeolaceae	*Tropaeolum majus* L.	*	Y	N	Y		Y
Typhaceae	*Typha domingensis* Pers.	native	N	Y	N		N
Typhaceae	*Typha orientalis* C.Presl	native	Y	Y	N		Y
Ulmaceae	*Ulmus parvifolia* Jacq.	*	N	N	N		Y
Urticaceae	*Parietaria judaica* L.	*	N	N	N		Y
Verbenaceae	*Lantana camara* L.	*	Y	N	Y		Y
Verbenaceae	*Verbena bonariensis* L.	*	Y	N	Y		Y
Verbenaceae	*Verbena officinalis* L.	*	Y	N	N		N
Verbenaceae	*Verbena quadrangularis* Vell.	*	N	N	N		Y
Violaceae	*Viola banksii* K.R.Thiele & Prober	planted	N	N	N		Planted
Violaceae	*Viola betonicifolia* Sm.	native	Y	Y	N		N
Vitaceae	*Cayratia clematidea* (F.Muell.) Domin	native	N	N	N		Y
Vitaceae	*Cissus antarctica* Vent.	native	N	N	N		Y
Xanthorrhoeaceae	*Xanthorrhoea minor* R.Br. subsp. *minor*	native	Y	Y	N		Y
Zamiaceae	Macrozamia spiralis *(Salisb.) Miq.*	native	Y	Y	N		Y

Appendix 2: Changes made to historical species lists.

Species	Explanation
Price 1979, added species	
Cestrum parqui	Price named this species in his final combined species list for Wategora Reserve and Rookwood Cemetery, but didn't specify which site he observed it at. However, he annotated the habitat as 'Low woodland, Duck River', and thus he must have seen it in Wategora Reserve.
Price 1979, removed taxon	
Caesia parviflora var. *vittata*	Price listed both *Caesia parviflora* var. *parviflora* and *Caesia parviflora* var. *vittata* as separate entities. Since the master species list treats unique entities at a species level or coarser, these two listings become duplicates. I also observed both varieties of this species.
Diuris brevifolia	In Colin Gibson's field notes, he annotated this species as being a misidentification (by Price) of *Diuris sulphurea*, which was already listed by Price. Also note that *Diuris brevifolia* is a South Australia endemic.
Vicia sativa subsp. *nigra*	Price listed *Vicia angustifolia*, but that taxon is now synonymised under *Vicia sativa* subsp. *nigra*, and *Vicia sativa* was already separately listed by Price. Since the master species list treats unique entities at a species level or coarser, these two listings become duplicates.
Gamochaeta purpurea	Price listed both *Gamochaeta purpurea* and *Gamochatea spicatum*, but the latter is now synonymised under the former, so these two listings become duplicates.
Eucalyptus globulus subsp. *pseudoglobulus*	Price listed *Eucalyptus globulus* subsp. *maidenii* and *Eucalyptus globulus* subsp. *st. johnii*. The latter is now referrable to *Eucalyptus globulus* subsp. *pseudoglobulus*. Since the master species list treats unique entities at a species level or coarser, these two listings become duplicates.
Eucalyptus cladocalyx	This species was listed by Price, however, Hewitt (2013) noted that, for his surveys, Price "also drew from his observations of the 'scattered, veteran eucalypts' of the State hospital grounds at Lidcombe, the Carnarvon Golf Course at Berala, and various parks and yards immediately east and west of [Wategora Reserve and Rookwood Cemetery]." Further, on page 27 of Price (1979), he explicitly noted that all species annotated with a 'D' were from "Duck River; **rarely, west of the southern railway**' (emphasis mine; i.e., outside of the actual survey area). This is further supported by Price's omission of habitat information for this species. Also, given I did not observe this species during my survey, I believe it is very likely that it was indeed observed by Price, but in the general vicinity around Wategora Reserve, and not in the study area itself.
Eucalyptus leucoxylon	As for *Eucalyptus cladocalyx*.
Eucalyptus melanophloia	As for *Eucalyptus cladocalyx*.
Eucalyptus nicholii	As for *Eucalyptus cladocalyx*.
Corymbia maculata	As for *Eucalyptus cladocalyx*.
Eucalyptus acaciiformis	As for *Eucalyptus cladocalyx*.
Eucalyptus botryoides	As for *Eucalyptus cladocalyx*.
Eucalyptus crebra	As for *Eucalyptus cladocalyx*.
Eucalyptus elata	As for *Eucalyptus cladocalyx*.
Eucalyptus pilularis	As for *Eucalyptus cladocalyx*.
Eucalyptus robusta	As for *Eucalyptus cladocalyx*.
Angophora costata	As for *Eucalyptus cladocalyx*.
Eucalyptus viminalis	As for *Eucalyptus cladocalyx*.
Eucalyptus cinerea	As for *Eucalyptus cladocalyx*.
Eucalyptus paniculata	This species was listed by Price as a native, but he then omitted it from his 1988 list. In his 1979 list, Price included a table (between the pages numbered 20 and 21) providing more information on eucalypts he observed. *Eucalyptus paniculata* was included in this table, and Price explicitly noted this species was planted in the reserve. His original annotation of it as native/naturally occurring in his 1979 species list must therefore have been an error that he realised and corrected for his 1988 list. I also observed a planted *Eucalyptus paniculata* within the reserve, and thus have removed this species given its representation in the reserve only by planted individuals.
Price 1979, changed name	
Cheilanthes tenuifolia sens. lat. becomes *Cheilanthes sieberi*	In his 1988 list, Price did not list *Cheilanthes tenuifolia*, but instead listed *Cheilanthes sieberi*; I believe he was correcting an initial misidentification (especially noting his original annotation of 'sens. lat.' in his 1979 list) and that his original 1970s observations were thus of *Cheilanthes sieberi*. I also observed *Cheilanthes sieberi* as a very common species currently present in Wategora Reserve, and did not observe *Cheilanthes tenuifolia*.
Denhamia cunninghamii becomes *Denhamia silvestris*	In his 1988 list, Price did not list *Denhamia cunninghamii*, but instead listed *Denhamia silvestris*; I believe he was correcting an initial misidentification (especially noting the native range of *Denhamia cunninghamii* does not extend to Sydney), and that his original observations were thus of *Denhamia silvestris*. I also observed *Denhamia silvestris* as a common species currently present in Wategora Reserve, and did not observe *Denhamia cunninghamii*.

Species	Explanation
Senecio lautus becomes *Senecio madagascariensis*	It was not until the 1980s that the presence of the very similar, non-native species *Senecio madagascariensis* in Australia was realised, and indeed Thompson (2005) explicitly notes that "Prior to [the early 1980s], specimens of [*Senecio madagascariensis*] had been assigned to *S. lautus*". *Senecio lautus* was not listed by Price in his 1988 list, so I believe his original observations were thus of *Senecio madagascariensis*, and that he realised this and self-corrected his list. I also observed *Senecio madagascariensis* as a common species currently present in Wategora Reserve
Cassinia arcuata becomes *Cassinia sifton*	Until 2017, the entity that Price observed was referred to by the misapplied name *Cassinia arcuata*. Orchard (2017) provided the new name *Cassinia sifton* for this entity, and presents a comprehensive discussion of the nomenclatural confusion surrounding these two species. I also observed *Cassinia sifton* during my survey.
Lagenophora stipitata becomes *Lagenophora sublyrata*	Price listed this as *Lagenophora stipitata*. Bean and Wang (2017) note that *Ixauchenus sublyratus* was historically placed as a synonym of *Lagenophora stipitata*, but was actually a valid species. Wang and Bean (2019) then created *Lagenophora sublyrata* as a new combination based on *Ixauchenus sublyratus*. Combined with the fact that I observed *Lagenophora sublyrata* as a common species currently present in Wategora Reserve, and did not observe *Lagenophora stipitata*, I believe that Price observed *Lagenophora sublyrata*.
Dillwynia juniperina becomes *Dillwynia sieberi*	Price listed this as *Dillwynia juniperina*, however, Albrecht and Crisp (1993) note that the two species [*Dillwynia juniperina* and *Dillwynia sieberi*] had been confused under the name *Dillwynia juniperina*. They concluded that *Dillwynia juniperina* s.s. has a distribution in Victoria and a few sites in southern NSW, and reinstated the name *Dillwynia sieberi* for plants distributed across southeastern QLD, NSW, and a small area in eastern Victoria. Price therefore observed *Dillwynia sieberi*.
Narcissus (*jonquilla*?) becomes *Narcissus* sp.	Price listed this as '*Narcissus* (*jonquilla*?)'. Given his uncertainty as to which species he observed, and that *Narcissus pseudonarcissus* and *Narcissus tazetta* are also naturalised in Sydney, I have downgraded this listing to genus.
Aloe sp. becomes *Aloe maculata*	There is currently a large, well-established naturalised patch of *Aloe maculata* in the reserve, likely the same population seen by Price, and this is the most common naturalised Aloe species in the area.
Erythrina sp. becomes *Erythrina crista-galli*	Price listed this as *Erythrina* sp.; I believe he observed *Erythrina crista-galli*. *Erythrina crista-galli* is currently abundant and widespread along the length of the creek in the reserve, including several very large/old individuals that almost certainly would have been present during Price's survey. It is also the only *Erythrina* species currently present in the reserve.
Cotoneaster sp. becomes *Cotoneaster glaucophyllus*	Price listed this as *Cotoneaster* sp., however, given that Neff and Rawling (1990) recorded *Cotoneaster glaucophyllus*, I observed *Cotoneaster glaucophyllus* during my survey, and that the *Cotoneaster glaucophyllus* I observed would have been present during Price's survey given its size/age, I'm confident Price also observed *Cotoneaster glaucophyllus*.
Arthropodium milleflorum becomes *Arthropodium* sp. South-east Highlands (N.G.Walsh 811) Vic. Herbarium	Price listed this as *Arthropodium milleflorum*, however, I believe that he observed *Arthropodium* sp. South-east Highlands (N.G.Walsh 811). The two species are very similar, and difficult to separate when not in flower; in both the PlantNET and VicFlora keys, the two species are separated based on anther colour (purple versus white or green respectively). The first reference to this entity is the now synonymised *Arthropodium* sp. Tasmania (N.Brittan s.n.) from 1991 (see https://biodiversity.org.au/nsl/services/rest/node/apni/2911412), twelve years after Price's 1979 list. This was followed by *Arthropodium* sp.B (1993) and *Arthropodium* sp.2 (1994). *Arthropodium* sp. South-east Highlands (N.G.Walsh 811) is currently common and widespread throughout the reserve based on my observations, and I did not observe *Arthropodium milleflorum* during my survey.
Artemisia vulgaris becomes *Artemisia verlotiorum*	Price listed this as *Artemisia vulgaris*, however, I believe that he observed *Artemisia verlotiorum*. All current floras for NSW or Sydney list either *Artemisia verlotiorum* as the sole naturalised *Artemisia* species, or both *Artemisia verlotiorum* and *Artemisia arborescens*, with none listing *Artemisia vulgaris*. *Artemisia verlotiorum* is currently abundant and widespread along the length of the creek in the reserve, and I did not observe *Artemisia vulgaris* during my survey. The two are also similar in appearance, and thus I believe Price's listing of *A. vulgaris* was a misidentification of *Artemisia verlotiorum*.
Myoporum insulare becomes *Myoporum boninense*	Price listed this species as *Myoporum insulare*, however, I believe that he observed *Myoporum boninense*. The two species are superficially similar, however, the habitat/vegetation type in the reserve is wrong for *Myoporum insulare*. Further, I observed *Myoporum boninense* during my survey, including some large/old individuals that were likely present during Price's survey, but did not observe *Myoporum insulare*.
Stackhousia viminea becomes *Stackhousia muricata*	Price listed this as *Stackhousia viminea*, however, I believe that he observed *Stackhousia muricata*. The two species are very similar, and difficult to separate when not fruiting. I observed *Stackhousia muricata* as a common species during my survey, but did not observe *Stackhousia viminea*. In personal communications, Colin Gibson also indicated to me that he has observed and collected *Stackhousia muricata* at nearby locations, but never *Stackhousia viminea*.
Homalanthus stillingiifolius becomes *Homalanthus populifolius*	In a letter to Colin Gibson dated 21/1/1992, Price noted that "Neither [*Deyeuxia appressa* and the *Homalanthus*] should be on the list. Doug [Benson] queried the *Omalanthus* six months or more back and I pointed out to him then that I was wrong." Price further clarified that the correct listing was *Homalanthus populifolius*.

Species	Explanation
Juncus sarophorus becomes *Juncus mollis*	Price listed this species as *Juncus sarophorus*, but Colin Gibson, in a letter to Price dated 31/12/1991, noted that this entity was likely to be *Juncus* sp. X based on his own collections and consultation with an authority. Price ceded this was probably correct in a letter dated 21/1/1992. *Juncus* sp. X is now recognised as *Juncus mollis*.
Xanthorrhoea resinosa subsp. *concava* becomes *Xanthorrhoea minor*	Price listed this as *Xanthorrhoea resinosa* subsp. *concava*, which has now been raised to species level, *Xanthorrhoea concava*, however, I believe that he observed *Xanthorrhoea minor*. The two species are superficially similar. I observed *Xanthorrhoea minor* during my survey, including some large/old individuals that were almost certainly present during Price's survey, but did not observe *Xanthorrhoea concava*.
Hypericum japonicum becomes *Hypericum gramineum*	In his 1988 list, Price did not list *Hypericum japonicum*, but instead listed *Hypericum gramineum*; I believe he was correcting an initial misidentification (especially noting that *H. japonicum* was annotated as common in the reserve in 1979, and thus it seems unlikely that by 1988 it would have completely disappeared from the reserve and been entirely replaced by a very similar, congeneric species), and that his original observations were thus of *Hypericum gramineum*. I also note that the PlantNET page for *Hypericum* states: "There is variability in the native plants currently identified as *Hypericum gramineum* and *H. japonicum* in Australia, and in light of preliminary morphological and molecular investigations there is the possibility of new taxa, the misapplication of names, hybridisation of taxa, etc."; the two can be easily confused.
Freesia refracta var. *odorata* becomes *Freesia* sp.	Price listed this as *Freesia refracta* var. *odorata*, however, this is a misapplied name in Australia. The widely naturalised *Freesia* naturalised in Australia is a hybrid taxon; different sources provide different hybrid formulas and it is unclear to me which is most appropriate to use, so I have chosen to list this entity as *Freesia* sp.
Hovea longifolia becomes *Hovea linearis*	Price listed this as *Hovea longifolia*, however, I believe that he observed *Hovea linearis*. The two species are similar, and indeed PlantNET currently notes that "Conservative taxonomic treatments of eastern forms in the past have resulted in the name *Hovea longifolia* historically being applied to the majority of the species described in this treatment". Further, I observed *Hovea linearis* during my survey, but did not observe *Hovea longifolia*.
Price 1988, added species	
Eucalyptus eugenioides	This species was listed by Price in his 1979 list, but then omitted in his 1988 list. In correspondence between Price and Gibson (1991–1993), Price initially explained that the omission was due to his difficulties separating *Eucalyptus eugenioides* from *Eucalyptus globoidea* in the reserve due to their similarity. However, Price eventually confirmed/accepted the presence of *Eucalyptus eugenioides* per Gibson's observations, and thus I have reinstated it here.
Pteridium esculentum	In correspondence with Colin Gibson (1992), Price noted that he had previously collected this species at Duck River, but it was ambiguous [in the letter] whether this was before or after the release of his 1988 list. However, it did appear in Price's 1979 list, and therefore his 1988 omission appears to be in error. I have thus reinstated it here.
Maireana microphylla	This species was annotated in Gibson's 1992 list as 'Seen before but not listed by GAP [Price]', i.e., mistakenly omitted from by Price from his 1988 list. I have thus added it here.
Plantago varia	This species was annotated in Gibson's 1992 list as 'Seen before but not listed by GAP [Price]', i.e., mistakenly omitted from by Price from his 1988 list. I have thus added it here.
Euchiton japonicus	Price listed this species as non-native in his 1979 list, and thus didn't include it in his 1988 list. However, it is actually a native species, so I have reinstated it here.
Poa affinis	Price listed this species as non-native in his 1979 list, and thus didn't include it in his 1988 list. However, it is actually a native species, so I have reinstated it here.
Portulaca oleracea	Price listed this species as non-native in his 1979 list, and thus didn't include it in his 1988 list. However, it is actually a native species, so I have reinstated it here.
Price 1988, removed taxon	
Caesia parviflora var. *vittata*	Price listed both *Caesia parviflora* var. *parviflora* and *Caesia parviflora* var. *vittata* as separate entities. Since the master species list treats unique entities at a species level or coarser, these two listings become duplicates. I also observed both varieties of this species.
Epilobium billardiereanum subsp. *cinereum*	Price listed both *Epilobium billardiereanum* subsp. *cinereum* and *Epilobium billardiereanum* subsp. *billardiereanum* as separate entities. Since the master species list treats unique entities at a species level or coarser, these two listings become duplicates.
Eucalyptus fibrosa subsp. *fibrosa* × *Eucalyptus moluccana*	A hybrid taxon, with both parent species already listed by Price.
Cotula coronopifolia	This is actually a non-native species, and thus I have removed it from Price's 1988 list given it was for native species only.
Callistemon linearis	Price listed both *Callistemon linearis* and *Callistemon rigidus*, but since the latter is now synonymised under the former, these two listings become duplicates.
Oxalis corniculata	This is actually a non-native species, and thus I have removed it from Price's 1988 list given it was for native species only.

Species	Explanation
Diuris brevifolia	In Colin Gibson's field notes, he annotated this species as being a misidentification (by Price) of *Diuris sulphurea*, which was already listed by Price. Also note that *Diuris brevifolia* is a South Australia endemic.
Cynodon dactylon	This species is non-native within the reserve, being an invader from the surrounding sporting fields, lawns and golf course. Price also annotated it as non-native in his 1979 list, and thus his 1988 listing of it as native was in error.
Deyeuxia appressa	In a letter to Colin Gibson dated 21/1/1992, Price noted that "Neither [*Deyeuxia appressa* and *Homalanthus stillingiifolius*] should be on the list."
Poa annua	This is actually a non-native species, and thus I have removed it from Price's 1988 list given it was for native species only.
Price 1988, changed name	
Brachyscome angustifolia var. *angustifolia* becomes *Brachyscome graminea*	This species was listed by Price as *Brachyscome angustifolia* var. *angustifolia*, but that name is now synonymised under *Brachyscome graminea*. See Short (2009) and Short (2014) for a discussion of the taxonomic confusion surrounding *Brachyscome angustifolia*.
Xanthorrhoea resinosa subsp. *concava* becomes *Xanthorrhoea minor*	Price listed this as *Xanthorrhoea resinosa* subsp. *concava*, which has now been raised to species level, i.e., *Xanthorrhoea concava*, however, I believe that he observed *Xanthorrhoea minor*. The two species are superficially similar. I observed *Xanthorrhoea minor* during my survey, including some large/old individuals that were almost certainly present during Price's survey, but did not observe *Xanthorrhoea concava*.
Cassinia arcuata becomes *Cassinia sifton*	Until 2017, the entity that Price observed was referred to by the misapplied name *Cassinia arcuata*. Orchard (2017) provided the new name *Cassinia sifton* for this entity, and presents a comprehensive discussion of the nomenclatural confusion surrounding these two species. I also observed *Cassinia sifton* during my survey.
Lagenophora stipitata becomes *Lagenophora sublyrata*	Price listed this as *Lagenophora stipitata*. Bean and Wang (2017) note that *Ixauchenus sublyratus* was historically placed as a synonym of *Lagenophora stipitata*, but was actually a valid species. Wang and Bean (2019) then created *Lagenophora sublyrata* as a new combination based on *Ixauchenus sublyratus*. Combined with the fact that I observed *Lagenophora sublyrata* as a common species currently present in Wategora Reserve, and did not observe *Lagenophora stipitata*, I believe that Price observed *Lagenophora sublyrata*.
Dillwynia juniperina becomes *Dillwynia sieberi*	Price listed this as *Dillwynia juniperina*, however, Albrecht and Crisp (1993) note that the two species [*Dillwynia juniperina* and *Dillwynia sieberi*] had been confused under the name *Dillwynia juniperina*. They concluded that *Dillwynia juniperina* s.s. has a distribution in Victoria and a few sites in southern NSW, and reinstated the name *Dillwynia sieberi* for plants distributed across southeastern QLD, NSW, and a small area in eastern Victoria. Price therefore observed *Dillwynia sieberi*.
Cassytha pubescens becomes *Cassytha paniculata*	Price listed this species as *Cassytha paniculata* in his 1979 list, but then changed it to *Cassytha pubescens* in his 1988 list due to *Cassytha paniculata* being synonymised under *Cassytha pubescens* (Weber 1981). However, *Cassytha paniculata* has since been recognised as a legitimate species occurring in Australia, and thus I have changed this back to Price's original listing, noting also that I observed *Cassytha paniculata* as a common species in the reserve during my survey, but did not observe *Cassytha pubescens*.
Arthropodium milleflorum becomes *Arthropodium* sp. South-east Highlands (N.G.Walsh 811) Vic. Herbarium	Price listed this as *Arthropodium milleflorum*, however, I believe that he observed *Arthropodium* sp. South-east Highlands (N.G.Walsh 811). The two species are very similar, and difficult to separate when not in flower; in both the PlantNET and VicFlora keys, the two species are separated based on anther colour (purple versus white or green respectively). The first reference to this entity is the now synonymised *Arthropodium* sp. Tasmania (N.Brittan s.n.) from 1991 (see https://biodiversity.org.au/nsl/services/rest/node/apni/2911412), three years after Price's list. This was followed by *Arthropodium* sp.B (1993) and *Arthropodium* sp.2 (1994). *Arthropodium* sp. South-east Highlands (N.G.Walsh 811) is currently common and widespread throughout the reserve based on my observations, and I did not observe *Arthropodium milleflorum* during my survey.
Mentha satureioides becomes *Mentha diemenica*	Price listed this as *Mentha satureioides*, however, I believe that he observed *Mentha diemenica*. During my survey I observed a single small patch of *Mentha diemenica* (with individuals clearly displaying the "short recurved simple hairs" as described on PlantNET), but did not observe *Mentha satureioides*. Notably, the PlantNET pages for these species state: "The current circumscription of *M. satureioides* and *M. diemenica* represents the extremes of what appears to be a morphological continuum and is sometimes called the *M. satureioides* group. Many populations show a range of intermediates or combinations of the characters given in the key." During the collecting expedition to the reserve in August 2023, I showed this population to Trevor Wilson and we collected multiple vouchers. Wilson confirmed that my identification of *Mentha diemenica* was correct. I thus believe Price's listing of *Mentha satureioides* was a misidentification of *Mentha diemenica*.
Myoporum insulare becomes *Myoporum boninense*	Price listed this species as *Myoporum insulare*, however, I believe that he observed *Myoporum boninense*. The two species are superficially similar, however, the habitat/vegetation type in the reserve is wrong for *Myoporum insulare*. Further, I observed *Myoporum boninense* during my survey, including some large/old individuals that were likely present during Price's survey, but did not observe *Myoporum insulare*.

Species	Explanation
Stackhousia viminea becomes *Stackhousia muricata*	Price listed this as *Stackhousia viminea*, however, I believe that he observed *Stackhousia muricata*. The two species are very similar, and difficult to separate when not fruiting. I observed *Stackhousia muricata* as a common species during my survey, but did not observe *Stackhousia viminea*. In personal communications, Colin Gibson also indicated to me that he has observed and collected *Stackhousia muricata* at nearby locations, but never *Stackhousia viminea*.
Homalanthus stillingiifolius becomes *Homalanthus populifolius*	In a letter to Colin Gibson dated 21/1/1992, Price noted that "Neither [*Deyeuxia appressa* and the *Homalanthus*] should be on the list. Doug [Benson] queried the *Omalanthus* six months or more back and I pointed out to him then that I was wrong." Price further clarified that the correct listing was *Homalanthus populifolius*.
Juncus sarophorus becomes *Juncus mollis*	Price listed this species as *Juncus sarophorus*, but Colin Gibson, in a letter to Price dated 31/12/1991, noted that this entity was likely to be *Juncus* sp. X based on his own collections and consultation with an authority. Price ceded this was probably correct in a letter dated 21/1/1992. *Juncus* sp. X is now recognised as *Juncus mollis*.
Hovea longifolia becomes *Hovea linearis*	Price listed this as *Hovea longifolia*, however, I believe that he observed *Hovea linearis*. The two species are similar, and indeed PlantNET currently notes that "Conservative taxonomic treatments of eastern forms in the past have resulted in the name *Hovea longifolia* historically being applied to the majority of the species described in this treatment". Further, I observed *Hovea linearis* during my survey, but did not observe *Hovea longifolia*.
Rawling and Neff 1990, removed taxon	
Persicaria decipiens	This is actually a native species, and thus I have removed it given Rawling and Neff's list was for non-native species only.
Persicaria lapathifolia	This is actually a native species, and thus I have removed it given Rawling and Neff's list was for non-native species only.
Juncus bufonius	This is actually a native species, and thus I have removed it given Rawling and Neff's list was for non-native species only.
Bothriochloa macra	This is actually a native species, and thus I have removed it given Rawling and Neff's list was for non-native species only.
Poa affinis	This is actually a native species, and thus I have removed it given Rawling and Neff's list was for non-native species only.
Rawling and Neff 1990, changed name	
Aloe sp. becomes *Aloe maculata*	There is currently a large, well-established naturalised patch of *Aloe maculata* in the reserve, likely the same population seen by Rawling and Neff, and this is the most common naturalised Aloe species in the area.
Apium sp. becomes *Apium graveolens*	*Apium graveolens* was listed by Price 1979, I observed *Apium graveolens* during my survey, and *Apium graveolens* is the only currently recognised naturalised non-native *Apium* for NSW.
Brassica sp. becomes *Brassica rapa*	*Brassica rapa* was listed by Price 1979, I observed it during my survey, and Rawling and Neff annotated this entity as 'Wild Turnip', which out of the various brassicas, is most often associated with *Brassica rapa*.
Cerastium sp. becomes *Cerastium glomeratum*	*Cerastium glomeratum* was listed by Price 1979, I observed it during my survey, and it is the most common naturalised *Cerastium* species in the Greater Sydney region.
Sisyrinchium sp. becomes *Sisyrinchium micranthum*	*Sisyrinchium micranthum* was listed by Price 1979, and Rawling and Neff annotated their entity as 'Yellow Rush Lily'; while this name usually refers to the native species *Tricoryne elatior*, I can find at least one online use of it for *Sisyrinchium micranthum*.
Rawling and Neff 1990, excluded entity	
Medicago sp.	Could be *Medicago polymorpha* or *Medicago sativa*, both listed by Price (1979), or a number of other non-native species.
Trifolium sp.	Could be *Trifolium campestre, Trifolium dubium, Trifolium glomeratum* or *Trifolium pratense*, all listed by Price (1979), or a number of other non-native species (aside from *Trifolium arvense* and *Trifolium repens*, both of which were already listed by both Rawling and Neff (1990) and Price (1979)).
Pelargonium sp.	Could be *Pelargonium* × *domesticum*, listed by Price (1979), or a number of other non-native species.
Oxalis sp.	Could be *Oxalis articulata, Oxalis corniculata, Oxalis debilis, Oxalis latifolia* or *Oxalis pes-caprae*, all listed by Price (1979), or a number of other non-native species.
Plantago sp.	I suspect they may have been referring to *Plantago varia*, a native species, as Price (1979) also mistakenly listed this species as non-native, but there are also a number of other non-native species it could be (aside from *Plantago lanceolata*, which was already listed by both Rawling and Neff (1990) and Price (1979), and *Plantago coronopus*, which was already listed by Rawling and Neff (1990)).
Prunus sp.	Could be *Prunus domestica* or *Prunus persica*, both listed by Price (1979), or a number of other non-native species.

Species	Explanation
Cyperus sp.	Could be *Cyperus brevifolius*, listed by Price (1979), or a number of other non-native species (aside from *Cyperus eragrostis*, which was already listed by both Rawling and Neff (1990) and Price (1979)).
Iris sp.	Could be *Iris germanica*, listed by Price (1979), or a number of other non-native species.
Lolium sp.	Could be *Lolium multiflorum*, listed by Price (1979), or a number of other non-native species (aside from *Lolium perenne*, which was already listed by both Rawling and Neff (1990) and Price (1979)).
Phalaris sp.	Could be *Phalaris minor* or *Phalaris aquatica*, both listed by Price (1979), or a number of other non-native species.
Juncus sp.	Could be *Juncus articulatus*, listed by Price (1979), or a number of other non-native species (aside from *Juncus capitatus*, which was already listed by Rawling and Neff (1990)).
Gibson 1992, removed taxon	
Maireana microphylla	This species was annotated in Gibson's 1992 list as 'Seen before but not listed by GAP [Price]', i.e., mistakenly omitted from by Price from his 1988 list. I have therefore moved this listing to Price (1988), given Gibson's 1992 list was intended to cover species not observed by Price.
Pteridium esculentum	In correspondence with Colin Gibson (1992), Price noted that he had previously collected this species at Duck River, but it was ambiguous [in the letter] whether this was before or after the release of his 1988 list. However, it did appear in Price's 1979 list, and therefore his 1988 omission appears to be in error. I have thus reinstated it to Price (1988) and removed it from Gibson (1992), given Gibson's list was explicitly intended to list native species that Price had not already recorded.
Eucalyptus eugenioides	This species was listed by Price in his 1979 list, but then omitted in his 1988 list. In correspondence between Price and Gibson (1991–1993), Price initially explained that the omission was due to his difficulties separating *Eucalyptus eugenioides* from *Eucalyptus globoidea* in the reserve due to their similarity. However, Price eventually confirmed/accepted the presence of *Eucalyptus eugenioides* per Gibson's observations, and thus I have removed it here given Gibson's list was explicitly intended to list native species that Price had not already recorded.
Opercularia hispida	In correspondence with Gibson (1992), Price stated that he believed *Opercularia hispida* was a misidentification on Gibson's part; in Gibson's reply (23/1/1992), he ceded 'You are probably right about *Opercularia hispida*. What I was pointing at in 1988 was probably juvenile growth of *O. aspera* after the recent fire. I have recently been back in that area and could only find *O. aspera*.' I have thus removed it here given Gibson's list was explicitly intended to list native species that Price had not already recorded.
Austrostipa rudis subsp. *rudis*	Price listed *Austrostipa rudis* subsp. *nervosa* in his 1979 and 1988 lists. Since the master species list treats unique entities at a species level or coarser, these two listings become duplicates.
Lobelia anceps	Price listed this species in his 1979 list. I have thus removed it here given Gibson's list was explicitly intended to list native species that Price had not already recorded.
Gibson 1992, changed name	
Amyema sp. becomes *Amyema miquelii*	In Colin Gibson's field notes (dated Nov/Dec 1990), this entity was annotated as '*Amyema pendula* (or *miquelii*)'. Given that *Amyema miquelli* is currently quite common throughout the reserve based on my observations, and that I did not observe *Amyema pendula* during my survey, I believe Gibson observed *Amyema miquelii*.

Appendix 3: Additional morphotypes awaiting taxonomic revision.

Described taxon	Explanation
Lepidosperma laterale	At least two, possibly more, morphotypes within the *Lepidosperma laterale* complex present in Wategora which may be described as different species (R. Barrett, pers. comm.). The two most common are the smaller, slender morphotype (1) and the larger, more robust morphotype (2). The two often grow side-by-side in the reserve. (1): https://www.inaturalist.org/observations/179471329 (2): https://www.inaturalist.org/observations/179470371
Dichondra repens	Two morphotypes of *Dichondra repens* present in Wategora. The first has smaller leaves that are less hairy on both surfaces (and generally less hairy stems). It seems to prefer wetter micro-sites (1). The second has larger leaves that are very hairy on both surfaces (with hairier stems). It seems to prefer drier micro-sites (2). The larger-leaved morphotype is probably *Dichondra repens* s.s., with the smaller-leaved morphotype referrable to *Dichondra* sp. aff. *repens*. (1): https://www.inaturalist.org/observations/195139175 (2): https://www.inaturalist.org/observations/195139174
Dianella caerulea	Two distinct morphotypes present in Wategora which may be described as new species (C. Gibson and G. Carr, pers. comm.). The first morphotype is larger and more robust, strongly erect with taller stems, and forms very large, strongly rhizomic patches. It is only present in the northern third of the reserve, often in more fertile soil (1). The second morphotype is smaller, generally more sprawling/less erect with shorter stems, and is only weakly rhizomic. It is present across the reserve, but far more common in the middle and southern sections (2). (1): https://www.inaturalist.org/observations/195137690 (2): https://www.inaturalist.org/observations/195137692
Caesia parviflora	Two described varieties of this species are present in Wategora: *Caesia parviflora* var. *parviflora* (1) and *Caesia parviflora* var. *vittata* (2). The latter is far more common in Wategora, and may be elevated to full species in future (R. Barrett, pers. comm.). (1): no images taken (2): https://www.inaturalist.org/observations/63629466
Oplismenus hirtellus	Where the Australian Plant Census and most state herbaria recognise a single species, *Oplismenus hirtellus*, the New South Wales and Queensland herbaria recognise two species, *Oplismenus aemulus* (1) and *Oplismenus imbecilis* (2). Both are present in Wategora (with *Oplismenus aemulus* far more common), so if they are both recognised again in future, the reserve will gain one species. (1): https://www.inaturalist.org/observations/194867153 (2): https://www.inaturalist.org/observations/70491552
Lantana camara	*Lantana camara* has long been recognised as a complex containing numerous different varieties, many of them resulting from hybridisation (Johnson 2007), and at least 29 different varieties are recognised as occurring in Australia (Smith and Smith 1982). Two of these occur in Wategora: the 'common pink flowered variety', which is common and widespread in Wategora (1) and a less common variety with more scabrous leaves, and darker and differently shaped flowers (2). The latter may be described as a new species in future (P. Lu-Irving, pers. comm.). (1): https://www.inaturalist.org/observations/60684556 (2): https://www.inaturalist.org/observations/180231719
Lysimachia arvensis	Two varieties of *Lysimachia arvensis* are present in Wategora: the orange-flowering *Lysimachia arvensis* var. *arvensis* (1), and the blue-flowering *Lysimachia arvensis* var. *caerulea* (2). The blue-flowering variety was recently elevated to full species (Jiménez-López et al. 2022) as *Lysimachia loeflingii*. If/when the Australian Plant Census recognises this update, Wategora will gain a species. (1): https://www.inaturalist.org/observations/103134914 (2): https://www.inaturalist.org/observations/183056338

BOTANIC GARDENS OF SYDNEY

Cunninghamia

A journal of plant ecology for eastern Australia

ISSN 2200 – 405X (Online)

Phoenix and *Washingtonia* palms as epiphytes on suburban street trees, Albury, NSW, Australia—five years on

Dirk HR Spennemann

School of Agricultural, Environmental and Veterinary Sciences; Charles Sturt University; PO Box 789; Albury NSW 2640, Australia.
email: dspennemann@csu.edu.au (Corresponding Author)

Abstract

A survey of suburban street trees in central Albury in southwestern NSW in July-August 2019 recorded 15 *Phoenix canariensis* and *Washingtonia robusta* palms growing as epiphytes in *Platanus x acerifolia* and *Ulmus glabra* trees. The survey was repeated in September 2024. All but two epiphytes encountered in 2019 were still alive in 2024 with no significant increase in size or number of live leaves. One additional specimen has appeared since then. The death of two individuals is attributed to adverse human intervention.

Keywords: *Phoenix canariensis*, *Washingtonia robusta*, dispersal, marginal environments, frugivory

Dirk HR Spennemann (2024)
Phoenix and *Washingtonia* palms as epiphytes on suburban street trees, Albury, NSW, Australia—five years on
***Cunninghamia* 24: 043–046**
doi: 10.7751/cunninghamia.2024.003

Accepted: 24 September 2024
Published: 20 December 2024

© 2024 The Author(s) or their employer(s). Published by Botanic Gardens of Sydney.
This is an open access article distributed under the Creative Commons Attribution-NonCommercial 4.0 International License (CC BY-NC)
OPEN ACCESS

Introduction

Frugivore dispersed specimens of ornamental palms, primarily the Canary Islands date palm *Phoenix canariensis* (Spennemann, 2019b) and fan palms *Washingtonia filifera* and *Washingtonia robusta* (Spennemann, 2020d) have been documented as surviving in highly marginal environments, such as shallow water bodies (Spennemann, 2018b) and as epiphytes in crooks and branch scars of trees (Spennemann, 2019d).

Albury, a rural service town in the Southern Riverina, NSW, experiences an average annual rainfall of 700 mm, with average seasonal temperatures of 2.7°C in winter and 31.2°C in summer. The central area, a 19th century development, is characterized by streets lined with mature trees and well-established residential gardens, many featuring exotic palms like *Phoenix canariensis* and *Washingtonia robusta*. The street trees are mostly deciduous, dominated by species such as *Platanus* x *acerifolia* London plane; *Ulmus glabra* Elm, *Acer rubrum* Red Canadian Maple, *Fraxinus pennsylvanica* Green Ash and *Liquidambar styraciflua* Liquidambar. Residual native Eucalypts, mainly *Eucalyptus melliodora* Yellow Box only exist in settings peripheral to the urban core.

In July and August 2019 the author undertook a survey of palms growing as epiphytes in suburban street trees in Albury (Spennemann, 2019d). At the time, 15 occurrences were documented (Table 1), nine *Phoenix canariensis* and six *Washingtonia robusta* plants. Perusal of Google Streetview images going back to 2007 indicated putative ages for most of these, with many specimens older than ten years. The paper also provided some speculative comments on the longer-term future of these plants. The present paper reports on a resurvey of the area, five years later, and discusses new recruitment and persistence of previously encountered epiphytic specimens.

Method

The survey of 2019 was repeated in September 2024in the same spatial area (Albury's historic urban core). As the survey was carried out during the southern winter, the street trees had lost their foliage and were observable in their entirety. All specimens identified in the 2019 survey were reassessed, counting the number of leaves and estimating their height.

Results and Discussion

All specimens of *Phoenix canariensis* that were growing during the 2019 survey were still thriving in 2024 (Table 1). They maintained their living leaf numbers and maintained, or marginally increased their plant height, but not significantly. Compared to 2019 most specimens exhibited more dried leaves. Of the six specimens of *Washingtonia robusta* observed in 2019 one had disappeared (nº 14) and another in the same street had died (nº 15). On the latter tree a new *Washingtonia robusta* had seeded in a branch scar to the south (nº 16). That plant is observable on the Google Streetview image of May 2023 but not on the image of May 2021. Imagery of plant nº 15, taken in February 2022 shows four erect leaves as well as approximately twenty old and dried, drooped leaves. Two of the erect leaves were fully unfolded but had yellowed, with parts of the petiole still green. The two folded leaves were a full-length leaf which in part was still green and an emerging leaf (ca 30% of future length) that was fully green. An examination of a May 2021 Google Streetview image shows the plant to be healthy at the time, with three unfolded leaves and one emerging one. An examination of Google Streetview imagery shows plant nº 14 to be present in May 2021 but missing in May 2023. Prior to the February 2022 observation some arborist work had been undertaken in the street as part of the maintenance of overhead powerlines. It is likely that nº 14 was removed at this time.

New recruitment

The main dispersers of these palm species in Albury are Pied Currawongs (*Strepera graculina*), European Blackbirds (*Turdus merula*) and Grey-headed Flying Foxes (*Pteropus poliocephalus*) as well as Red Foxes (*Vulpes vulpes*) (Spennemann, 2018a, 2019c, 2020b, 2020e). Of these, only Pied Currawongs access the crowns of the street trees under discussion. Seeds of *Phoenix canariensis* regurgitated by Pied Currawongs have a significantly higher chance of germination than seeds from unconsumed drupes (Spennemann, Pike, & Robinson, 2021). *Phoenix canariensis* rapidly establishes in watered domestic gardens. In generally dry bushland the species will germinate following moisture pulses (Spennemann, 2020a). Once established, the water demands of *Phoenix canariensis* are low compared to other ornamentals and the plants are relatively drought tolerant (Cubino, Subirós, & Lozano, 2014; Hernández, Morales, & Saurí, 2014; May, Livesley, & Shears, 2013; Pittenger, Downer, Hodel, & Mochizuki, 2009). *Washingtonia*, on the other hand, require well-watered settings, such as urban gardens or wetlands (Spennemann, 2018b) but will not establish in dry environments even with a moisture pulse (Spennemann, 2019a)

Vector-dispersed *Washingtonia robusta* and *Phoenix canariensis* occur in garden settings and as road-side vegetation throughout Albury (see data in iNaturalist). It is not possible to quantify the total number of self-seeded palms as access to private backyards is not feasible; small specimens to not show on aerial imagery until they have developed a full canopy. Judging from front yards, recruitment of both species in the urban core is ongoing as many juvenile plants escape detection or are tolerated. The only recruitment of palms in epiphytic settings comprised a single *Washingtonia robusta* growing on a *Platanus x acerifolia* (nº 16) that had previously hosted another *Washingtonia robusta* (nº 15). Outside the urban core *Phoenix canariensis* have been colonising the Gum Grassy Woodlands of the surrounding hills (pers obs.)

Growth rates

Data on growth rates of *Phoenix canariensis* and *Washingtonia robusta* are extremely limited, with overseas data suggesting rates between 0.3–0.5 m per year for under 25 year-old plants (reviewed in Spennemann, 2020c). A comparison of the size difference of the epiphytic specimens between 2019 and 2024 shows that *Washingtonia robusta* maintained their 2019 height, while *Phoenix canariensis* plants grew on average 0.0163 m per year. This contrasts with an annual growth rate of 0.21 m observed at a well-irrigated set of 110 *Phoenix canariensis* growing 13 km southeast of the study area (Spennemann, 2020c). While Albury experienced below average rainfall in the summer of 2019 / 2020 as well as in the winter of 2024 (Bureau of Meterology, 2024), this did not materially affect the number of dead (brown) leaves that were observable in 2024. Rather, among epiphytic palms leaves brown and die as new leaves emerge. A good example is nº 13, for which, by virtue of its placement at chest height, more observations exist. While the plant continually produces new leaves, at any given time there are never more than three unfolded leaves.

Implications

Setting aside the two lost *Washingtonia robusta* plants, the resurvey of 2024 has demonstrated that epiphytes can persist without detrimental human intervention. The prediction that specimens would outcompete the other in cases where multiple specimens were growing in the same branch scar has not eventuated to date. Several epiphytic *Phoenix canariensis* and *Washingtonia robusta* plants are well over 10 years old, one *Phoenix canariensis* (nº 1) at least 16 years old. All plants remained in their 2019 growth state, even palm nº 8 which had been a two-leaf seedling, with their overall size not significantly increasing. None of them had developed flowers, not even the 16-year-old *Phoenix*, suspending the palms in an 'auto-bonzaied' state, similar to plants that are ultimately size-constrained when pot grown. Given that these epiphytic specimens do not mature and fruit, there is little risk that they will ever become seed sources in their own right. What this study does demonstrate, however, is the resilience and persistence of these two palm species, and in particular *Phoenix canariensis,* to persist in extremely marginal settings.

Table 1. Instances of epiphytic growth of ornamental palms in Albury, NSW P.a.— *Platanus x acerifolia*; U.g.— *Ulmus glabra*

					July-August 2019			September 2024			Age
		Host			Size	Leaves		Size	Leaves		in
Nº	Location	tree	Plant	Habit	(m)	green	brown	(m)	green	brown	2024
					Phoenix canariensis						
1	684 Dean St (Wilcox)	P.a.		juv.	0.8–1.0	9	7	0.8–1.0	9	9	> 16
2	611 Stanley St	P.a.	South	juv.	0.5–0.6	5	—	0.7–0.9	8	3	> 10
3	611 Stanley St	P.a.	North	juv.	0.5–0.6	5	—	0.7–0.9	7	4	> 10
4	622 Stanley St	P.a.		juv.	0.7–0.9	7	—	0.7–0.9	7	2	> 7
5	370 Tribune St	P.a.	South	juv.	0.6–0.7	4	—	0.6–0.8	5	2	> 8
6	370 Tribune St	P.a.	North	juv.	0.6–0.7	5	1	0.6–0.8	6	4	> 8
7	Noreuil Park	P.a.		juv.	1.1–1.4	?6–8	?4–6	tree felled April 2019			
8	832 Mate St	U.g.		seedl.	0.3–0.4	2	1	0.4	2	1	>6
9	782 David St	U.g.		juv.	0.7–0.9	8	7	0.7–0.9	8	4	> 8
					Washingtonia robusta						
10	459 Hovell St	P.a.	South	juv.	0.8–1.0	3	6	0.8–1.0	3	9	> 10
11	459 Hovell St	P.a.	North	juv.	0.3–0.5	2	6	0.3–0.5	2	8	> 10
12	573 Bonegilla St	P.a.		juv.	0.6–0.8	3	7	0.6–0.8	3	12	> 10
13	641 Macauley St	P.a.		juv.	0.3–0.4	3	5	0.3–0.4	3	9	> 7
14	568 Macauley St	P.a.		juv.	0.4–0.5	3	5		missing		≤ 8
15	577 Macauley St	P.a.	North	juv.	1.2–1.3	3	45+		dead		
16	577 Macauley St	P.a.	South	juv.	—	—	—	0.3-0.4	4	4	≤ 3

References

Bureau of Meterology. (2024). Climate statistics for Australian locations. Monthly climate statistics. Albury Airport (station nº 072160). Retrieved from URL

Cubino, J. P., Subirós, J. V., & Lozano, C. B. (2014). Maintenance, modifications, and water use in private gardens of Alt Empordà, Spain. *HortTechnology,* 24(3): 374-383.

Hernández, M., Morales, A., & Saurí, D. (2014). Ornamental plants and the production of nature (s) in the Spanish real estate boom and bust: the case of Alicante. *Urban Geography,* 35(1): 71-85.

May, P. B., Livesley, S. J., & Shears, I. (2013). Managing and monitoring tree health and soil water status during extreme drought in Melbourne, Victoria. *Arboricult Urban For,* 39: 136-145.

Pittenger, D. R., Downer, A. J., Hodel, D. R., & Mochizuki, M. (2009). Estimating water needs of landscape palms in Mediterranean climates. *HortTechnology,* 19(4): 700-704.

Spennemann, D. H. R. (2018a). Observations on the consumption and dispersal of *Phoenix canariensis* drupes by the Grey-headed flying fox (*Pteropus poliocephalus*). *European Journal of Ecology,* 4(1): 41–49. DOI

Spennemann, D. H. R. (2018b). *Washingtonia robusta* (Mexican Fan Palm) as a coloniser in an artificial wetland at Albury, New South Wales. *Cunninghamia,* 18: 109-122. DOI

Spennemann, D. H. R. (2019a). *Background to the Palms at Alma Park (NSW) IV: Blue Lane Homestead*. Albury, NSW: Institute for Land, Water and Society, Charles Sturt University. DOI

Spennemann, D. H. R. (2019b). The connective potential of vertebrate vectors responsible for the dispersal of the Canary Island date palm (*Phoenix canariensis)*. *Flora, 259*, 151468. DOI

Spennemann, D. H. R. (2019c). The contribution of the Canary Island date palm (*Phoenix canariensis*) to the winter diet of frugivores in novel ecosystems. *European Journal of Ecology,* 5: 27–37.

Spennemann, D. H. R. (2019d). Growth of ornamental palms, *Phoenix* and *Washingtonia*, as epiphytes on suburban street trees in Albury, NSW, Australia. *Cunninghamia,* 19: 113-119. DOI

Spennemann, D. H. R. (2020a). Canary Island date palms invading a remnant riverine eucalypt forest in south-eastern Australia: processes and patterns of recruitment. *Cunninghamia,* 20: 245–257. DOI

Spennemann, D. H. R. (2020b). Consumption of Canary Island Date Palm Phoenix canariensis drupes by Pied Currawongs *Strepera graculina*. *Australian Field Ornithology,* 37: 201–211. DOI

Spennemann, D. H. R. (2020c). *A grove of 110 Canary Islands date palms at Ebden, NE Victoria*. Albury, NSW: Institute for Land, Water and Society, Charles Sturt University. DOI

Spennemann, D. H. R. (2020d). Palms fanning out. A review of the ecological provisioning services provided by *Washingtonia filifera* and *W. robusta* in their native and exotic settings *Plant Ecology & Diversity,* 13(3–4): 289-324. DOI

Spennemann, D. H. R. (2020e). The role of canids in the dispersal of commercial and ornamental palm species. *Mammal Research,* 66(1): 57-74. DOI

Spennemann, D. H. R., Pike, M., & Robinson, W. (2021). Germination rates of old and fresh seeds and their implications on invasiveness of the ornamental Canary Islands date palm (*Phoenix canariensis*). *European Journal of Ecology,* 6: 70-86. DOI

BOTANIC GARDENS OF SYDNEY

Cunninghamia

A journal of plant ecology for eastern Australia

ISSN 2200 – 405X (Online)

Hidden in plain sight – rediscovery of two historic pressed plant specimen albums made by botanical collector William Bäuerlen

Kevin Mills[1] and Jane Johnston[2]

[1]12 Hyam Place, Jamberoo 2533, NSW AUSTRALIA. email: kevinmillskma@gmail.com

[2]P.O. Box 472, Berry 2535, NSW AUSTRALIA. email: janemjohnston@gmail.com

Abstract

Two 19th Century albums of pressed native plant specimens, one of flowering plants and one of ferns held by the Berry Museum, in Berry on the NSW South Coast are described and assessed as to their origin. The albums together contain 155 specimens almost entirely of indigenous plants: 90 species of flowering plants and 61 fern species. The albums have significant historical and botanical value.

The popularity of fern albums in 19th Century Australia is discussed. Both albums were inscribed in 1886 by John Stewart of Broughton Creek (later renamed Berry), New South Wales. Stewart has hitherto been credited with their compilation by the Museum. However, newly gathered evidence points to their compilation by the botanical collector William (Wilhelm) Bäuerlen (1840-1917), and to Stewart only having owned the albums. Notes on Bäuerlen's life and his interest in fern albums are included.

Kevin Mills and Jane Johnston (2024)
Hidden in plain sight – rediscovery of two historic pressed plant specimen albums made by botanical collector William Bäuerlen
***Cunninghamia* 24: 047–060**
doi: 10.7751/cunninghamia.2024.004

Accepted: 25 November 2024
Published: 20 December 2024

© 2024 The Author(s) or their employer(s). Published by Botanic Gardens of Sydney.
This is an open access article distributed under the Creative Commons Attribution-NonCommercial 4.0 International License (CC BY-NC)
OPEN ACCESS

Introduction

The Berry Museum, the small volunteer-run museum of the Berry & District Historical Society Inc. in the Shoalhaven town of Berry, New South Wales, has two albums of pressed plant specimens in its collection. These were inscribed in 1886 by John Stewart of Broughton Creek (later renamed Berry). We describe these albums, highlighting some points of interest about them and provide an analysis of the species contained within, including a plant species list using currently accepted taxonomic nomenclature. We contend that John Stewart (1845–1932) inscribed the albums in 1886 as owner, not compiler, and set out a compelling combination of evidence to attribute compilation of the albums to the botanical collector Wilhelm Bäuerlen (1840–1917), also known in Australia as William. There are various spellings of Bäuerlen in the literature; we have chosen to use the spelling used by Bäuerlen himself.

The albums

The two albums are similar in most ways. The album of catalogue number B70.1 (26 cm W x 31.5 H) has 34 pages of specimens of flowering plants. Album B70.2 (37 cm W x 28 cm H) contains 31 pages of fern fronds. They have green and black leather covers, and both originally had spines embellished with gold horizontal stripes. Inside at the back of each album, a small sticker names the manufacturer, 'M. W. & CO. London' and the album types, 'No. 6106' (B70.1) and 'No. 6107' (B70.2). Both have a front page that is blank except for an inscription, 'John Stewart Broughton Creek 26 August 1886'. This is followed by a decorative frontispiece page. The remainder of the pages feature decoratively arranged plant specimens that are adhered to thin cardboard pages, showing one to four species per page.

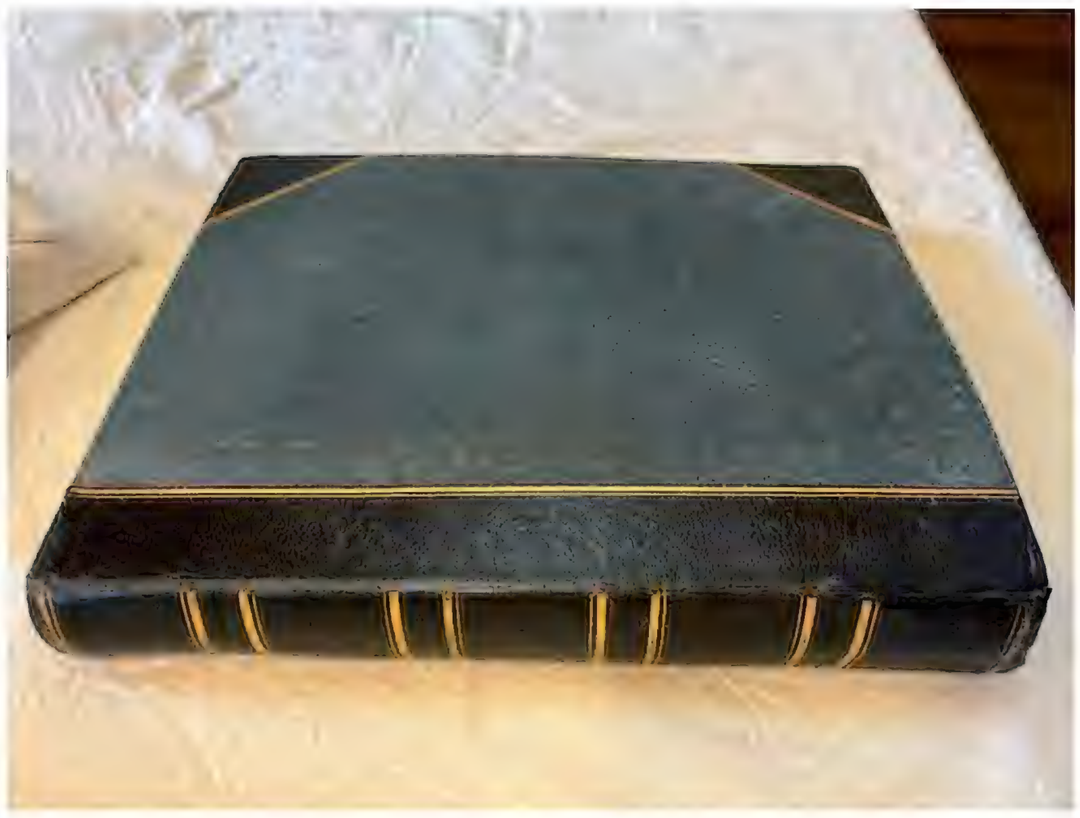


Figure 1. Exterior of album B70.1, the flowering plants album with the original spine. Photo: Jane Johnston.

Figure 2. Corner of the decorative frontispiece from the flowering plants album B70.1, inset with Stewart's inscription. Photo: Phil Bragg.

Figure 3. Example page from the fern album B70.2. The species are *Asplenium flabellifolium* Cav. (misidentified here as *Asplenium flabellatum* Kunze) and *Asplenium flaccidum* G.Forst. Photo: Phil Bragg.

The flowering plants album contains 90 angiosperm species represented by 90 specimens. There are 88 native species, including a tree, a sedge and various shrubs, vines, orchids and herbs, and two introduced species. The fern album contains 61 species of native ferns, represented by 65 specimens; four species of fern appear twice. The 61 species represent 48 % of the indigenous species found in the region which total 128 (Mills 2023). Taxonomic names and associated numbering for each species are handwritten on every page, though we note that one specimen, *Caustis flexuosa*, in the flowering plant album is not named. Appendix 1 contains a complete list of the species contained in both albums, providing the names written in the albums and the current names, along with other relevant information. Although not all of the 151 species represented in the albums could have been collected close to Berry, most could have been collected in the surrounding districts of Shoalhaven,

Illawarra and Southern Highlands. Also, some species only occur in districts much further away, including the NSW Northern Rivers region and Victoria, districts in which Bäuerlen was known to have collected.

The specimens and the albums in general are in remarkably good condition for their age. The Museum arranged for some professional conservation treatment on both albums in 2023, at which time a new plain black leather spine was attached to the fern album; the original spine was already detached.

The albums were owned by John Stewart (1845–1932), whose inscription noted his hometown of Broughton Creek. This was then a private town on the Coolangatta Estate (established by Alexander Berry and Edward Wollstonecraft in 1822) and later renamed Berry. Aside from Stewart's inscriptions, and the species names and numbering associated with the specimens, nothing else is written on the albums or the covers. The donors' names (Mrs and Mrs Stewart Blow) and the 1979 donation date are the only facts about these albums known to the Museum.

The Berry Museum's interpretative material previously presented John Stewart as the collector of the specimens and compiler of the albums. While the origin of the albums has not previously been questioned, our research indicates compellingly that the albums should be attributed to William Bäuerlen.

Method

The authors were independently investigating Bäuerlen's activities in the Shoalhaven when the albums were brought to the attention of KM by co-author JJ. At the Berry Museum, the albums were inspected, page by page, scrutinising the specimens and any markings. KM identified the species and determined the current taxonomic names. Joint study of correspondence by and to Bäuerlen in the Powerhouse Museum Archives was valuable for contextual information, and for evidence of Bäuerlen's handwriting. The great-granddaughter of John Stewart, Barbara Heriot, was contacted for Stewart's family history and samples of Stewart's handwriting. Barbara Heriot is the daughter of donors Mr and Mrs Stewart Blow (Stewart's grandson and his wife), now both deceased.

Our initial scepticism regarding Stewart as the creator of the plant albums arose early in the investigation, as Stewart was not known as a botanical person; the correct names of most of the plants would have been known by very few people at that time. Initial historical research by JJ, including a review of 1880s botanical collection data from the area around Berry (Australasian Virtual Herbarium), highlighted Bäuerlen's activities in the district in the 1880s in specimen collecting and in making and selling albums of pressed ferns. Our hypothesis became that that the albums were compiled by Bäuerlen and obtained by Stewart, who inscribed them as owner.

Pressed plant specimen albums: Historical context

According to sources including Kew Gardens (www.kew.org/read-and-watch/a-brief-history-of-plants-in-books), Luca Ghini (1490–1556), a professor of botany at the University of Bologna, was the first person to press and mount plant specimens onto paper, which he did for teaching purposes. A long history of plants being mounted on paper has ensued; in the nineteenth-century the making albums of pressed plants as a leisure pursuit was particularly fashionable. This history is a research speciality for Dr Molly Duggins (Lecturer in Australian Art at the National Art School). According to Duggins (pers. comm., 2023), this fashion began in Western Europe in the early nineteenth century and spread internationally. By the 1840s, it was becoming very popular in England and was well in swing in Australia by the 1880s. In England and in Australia, it was fuelled by the 'picturesque' tourist movement and the expansion of the railway network improving access to country areas. In the late 1880s, people were outdoors exploring Australia's landscapes in unprecedented numbers. Two very different publications from 1886 give a sense of how expeditions to see Australia's natural wonders were being encouraged: *The Picturesque Atlas of Australasia* (Garran 1886) and *The Railway Guide of New South Wales* (NSW Government 1886).

Albums of pressed plants were typically kept by the compiler-owner as a memento of personal experience to look at alone or in conversation with others, such as when entertaining guests at home (M. Duggins, pers. comm., 2023). These albums held value as 'social' objects, but sometimes specimens were swapped or bought, and some enterprising individuals created and sold ready-made pressed plant albums.

In Australasia, English-born Mary Ann Armstrong, also known as Mrs C. C. Armstrong, prepared albums on an ambitious scale. Duggins (2016) describes Armstrong's work to produce paper-based merchandise that featured pressed New Zealand ferns, including albums, cards, stationery and pictures. She began this work in New Zealand in the 1870s and continued in Australia after she moved to Melbourne in the late 1880s. Armstrong's work was visible in Australia; she presented her work and was recognised with prizes at the Sydney International Exhibition of 1879 and the Melbourne International Exhibition of 1880. The 'South Pacific Fern Album' series (late 1880s to early 1890s) is an example of her later and more elaborate work, produced in limited edition in conjunction with a publisher. Copies of this work are held by the State Library of New South Wales.

Armstrong and others who produced fern-themed merchandise at this time were entrepreneurially harnessing and feeding 'pteridomania', meaning fern mania, a term coined by the British clergyman, naturalist and writer Charles Kingsley in 1855 (https://www.historic-uk.com/CultureUK/Pteridomania-Fern-Madness/) to express the then immense popularity of ferns. Living and pressed ferns were popular, as were fern motifs in all manner of designed objects, furniture, tableware, clothing and more. The term was also used in the British colonies in Australia and New Zealand, where the phenomenon crossed social classes and peaked in the last quarter of the nineteenth century. How it manifested has been richly described by authors including Whittingham (2012), Bonyhady (2000), Horne (2005) and Duggins (2016).

William Bäuerlen (1840-1917)

William Bäuerlen was born on 27 October 1840 in Neidernall, Württemberg, Germany and died in Sydney on 28 October 1917 (Wilson 1990). In 1863, at the age of 23, he migrated to Australia on board the ship *San Francisco* from Hamburg to Moreton Bay, Queensland (Hamburg Passenger Lists, 1850–1934). For this voyage, he registered his occupation as a miller, but in Australia he became known as a skilled and prolific botanical collector. Approximately 8500 collections by Bäuerlen (sometimes instead

recorded as Baeuerlen) from eastern Australia and New Guinea are recorded in the Australasian Virtual Herbarium. Wilson (1990) notes that 'at least 70 species and infraspecific taxa have been described from his herbarium specimens' and 'about 20 of those taxa are named after him'.

Bäuerlen established himself in botany in the 1880s. By 1883, he had been contracted to collect for Baron Ferdinand von Mueller, the Government Botanist of Victoria (Wilson 1990). From mid-1886, Bäuerlen was also contracted to collect for Joseph Maiden, then the Curator at the Technological Museum (now the Powerhouse Museum) in Sydney. Bäuerlen was later appointed to the staff as Botanical Collector (1890-1905) (Wilson 1990). He was also the sole botanical collector of the Geographical Society of Australasia's *Bonitow* expedition to Papua New Guinea, and this resulted in the first of his only two publications as author; the Agricultural Society of Shoalhaven published Bauerlen's account of this *Bonito* expedition as *The Voyage of the Bonito* following his lecture on the expedition for the Society in Nowra in March 1886 (Bauerlen 1886). The other publication was Part 1 of *The Wild Flowers of New South Wales*, illustrated by Gertrude Lovegrove (Bäuerlen & Lovegrove 1891), which was self-funded by Bäuerlen and published by Angus & Robertson in a small print run in 1891. Wilson (1990) and Martin (2013) provide further insight into his life, noting that relatively little is known about some periods of his life, including his early years in Australia.

Newspaper pieces for the period 1883–1886 indicate that Bäuerlen gained an income and raised his profile by delivering lectures across the Shoalhaven and Illawarra (mostly on electricity) and by selling albums of pressed ferns he had compiled. The short newspaper pieces that ran about his fern albums include the following from *The Shoalhaven Telegraph* (16 August 1883)

> *The Ferns of Illawarra - This may fairly be said to be the title of a 'book' just completed and issued to the order of Mr. S. Matthews, of Cambewarra, by Mr. W. Bauerlin* [sic], *whose name has appeared* [sic] *in these columns recently as a lecturer on the wonders of electricity. The 'book' is a demi-folio volume of some 60 pages (card board) upon which appear in proper succession, beautifully preserved specimens of the ferns of the Illawarra and Shoalhaven districts. Mr Bauerlin is certainly an expert in the art of selecting specimens and of preserving them. We observe that Mr Bauerlin classifies and names the individual ferns; thus the book is not only valuable on account of the beauty of its contents, but in that it is the key to the botany of the fern family of the coast district, of which, probably, so complete a collection has never previously been made. Mr. Bauerlin has many orders for his books which are cheap, and we wish him success.*

Incidentally, Mr Samuel Matthews of Cambewarra is the husband of Georgina Matthews, née McKenzie, the sister of Kenneth McKenzie who designed *Meroogal*, a historic house in Nowra that is now part of the Museums of History NSW. Bäuerlen was part of the Meroogal social circle, and Kenneth McKenzie and Bäuerlen were close friends, as discussed in Martin (2013).

Bäuerlen may have been inspired to make and sell fern albums after learning about others who were doing so, perhaps Armstrong, and perhaps even by seeing her work at those International Exhibitions. We have no evidence to hand to know if this was so, or if he came up with the idea independently. In either case, his fern album enterprise is unsurprising; Bäuerlen was someone with developing interests and skills in botany who, like Armstrong, must have been well aware of the remarkable fern diversity in his local area and of the then extraordinary marketability of ferns, given the pteridomania phenomenon of the time.

Figure 4. Wilhelm Bäuerlen, c.1900. Photo: L. Herbst, Sydney. Caroline Simpson Library & Research Collection, Museums of History NSW.

Compilation by Bäuerlen: compelling evidence

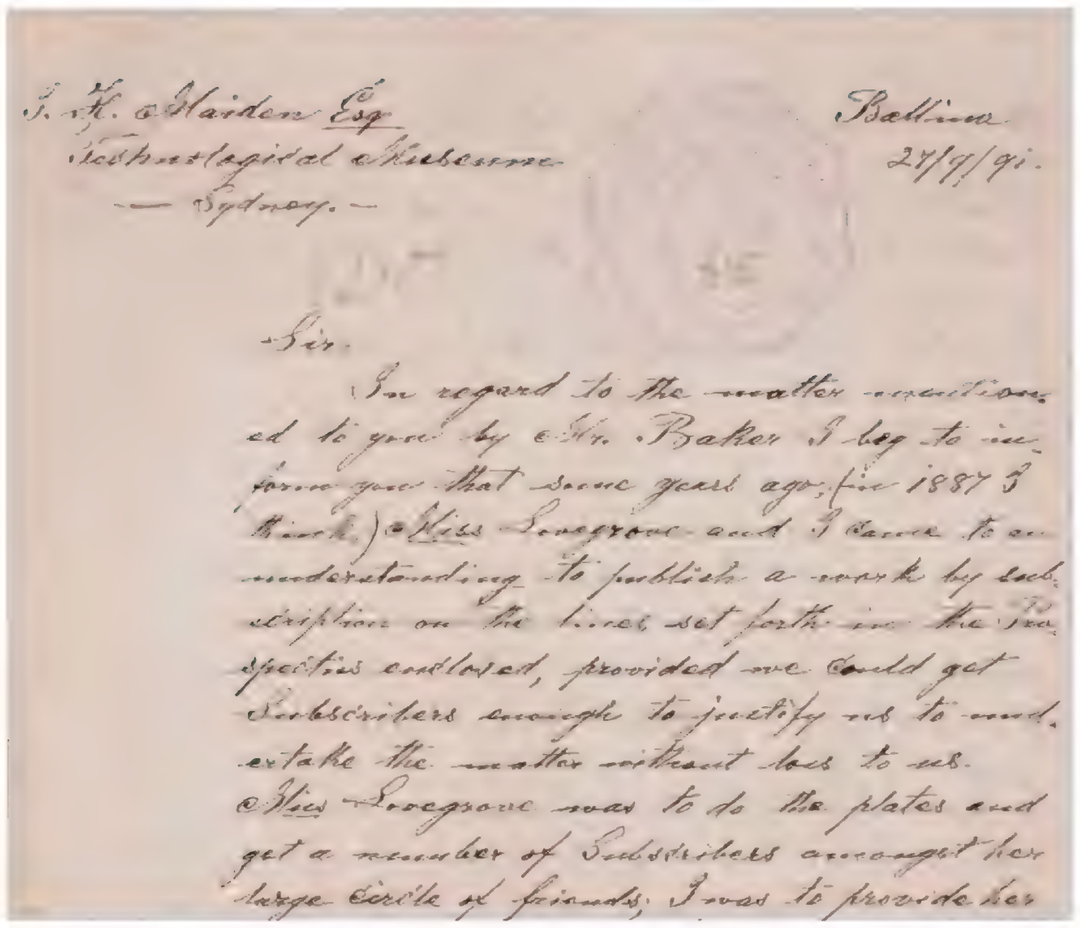
Handwriting

The handwriting of the scientific names in the albums is vastly different from Stewart's handwriting, as seen from Stewart's inscriptions in the albums and another sample provided to us by Stewart's great-granddaughter. Instead, it closely resembles handwriting known to be by Bäuerlen; it is strikingly close to certain samples in the Powerhouse Museum's Archives – letters and specimen labels that Bäuerlen deemed important enough to write in his fair and more decorative hand. Compare, for instance, the characteristic decorative flourishes on the capital letters H, L & B in Figure 5 from the Stewart fern album with those in Figure 6, a label for *Helipterum strictum* (Lindl.) Benth. (now *Rhodanthe stricta* (Lindl.) Paul G. Wilson) in a volume of pressed specimens from the Asteraceae family (Powerhouse Museum Archives MRS/264), and Figure 7, Bäuerlen's 'Lovegrove letter' to Joseph Maiden (Powerhouse Museum Archives MRS/203-3/87).

Additionally, the umlaut above the 'ä' in '*Lomaria Bäuerlenii*' and '*Correa Bäuerlenii*' in the Stewart albums also suggests Bäuerlen's writing, in the context of labelling in the Asteraceae family volume (Powerhouse Museum Archives MRS/264). This album includes several specimens labelled as collected by Bäuerlen, but only some of those specimens have labels written in Bäuerlen's own, easy-to-distinguish hand; those labels written by Bäuerlen are the only ones where his surname is written Bäuerlen, not Bauerlen.

Figure 5. Page from fern album B70.2. Compare the letters H, L & B between this page and Figures 6 & 7. The species are *Blechnum camfieldii* Tindale (here incorrectly as *Lomaria Bauerlenii* instead of the previous name *Lomaria capensis* var. *bauerlenii* F.M.Bailey) and *Hymenophyllum bivalve* (G.Forst.) Sw. Photo: Phil Bragg.

Figure 6. a. Specimen and collection label for *Helipterum strictum* (Lindl.) Benth. (now *Rhodanthe stricta* (Lindl.) Paul G. Wilson) from a volume of specimens of the plant family Compositae (Asteraceae), 1886–1890. Powerhouse Museum Archives MRS/264 b. Close up of the collection label. Photos: Jane Johnston.



J. H. Maiden Esq
Technological Museum
— Sydney. —

Ballina
27/9/91.

Sir.

In regard to the matter mention-
ed to you by Mr. Baker I beg to in-
form you that some years ago, (in 1887 I
think,) Miss Snowgrove and I came to an
understanding to publish a work by sub-
scription on the lines set forth in the Pro-
spectus enclosed, provided we could get
Subscribers enough to justify us to und-
ertake the matter without loss to us.
Miss Snowgrove was to do the plates and
get a number of Subscribers amongst her
large circle of friends; I was to provide her

Figure 7. Extract from a letter from Bäuerlen to Maiden, 1891. Powerhouse Museum Archives, MRS/203-3/87. Photo: Emma Bjorndahl.

Species included

The fern *Lastreopsis hispida* (Sw.) Tindale is in Stewart's fern album under its historical name, *Aspidium hispidum* Sw. (Figure 8). Bäuerlen was the collector of the only herbarium specimen of this species, held at NSW, to have been recorded as collected on the NSW South Coast, in 1884 at 'Broughers Creek' (Brogers Creek) in Kangaroo Valley. The presence of this species in the album along with its correct name suggests Bäuerlen as the compiler, notwithstanding the possibility that anyone could collect such a specimen. Bäuerlen's overall collection history (1886 and prior), as reflected in the herbarium specimens collected by Bäuerlen or Bauerlen on record in the Australasian Virtual Herbarium, indicates travels into certain areas for botanical collecting activities that might explain those species in the albums that are only found in locations distant from Berry; see Appendix 1.

Figure 8. The fern *Lastreopsis hispida (Sw.) Tindale*, named *Aspidium hispidum* in album B70.2. One frond has been lost, as indicated by the shadow on the sheet. Photo: Kevin Mills.

Layout

In the fern album, pages with multiple species have the ferns arranged radially, with the cut ends of the fronds usually tidied from view under roundels made of pressed moss, lichen or both. In the flowering plant album, the specimens are in a bouquet arrangement. These arrangements appear intended to be attractive and to show the specimens' botanical features. Nearly every specimen exhibits fertile material, flowers or fertile fern fronds; the ferns are frequently presented as a pair of fronds – one fertile, one infertile, side by side. Where some of the flowering plants have distinctive leaf undersides, both sides of a leaf are displayed, sometimes simply by a part of one specimen being folded or twisted over before being glued down, such as shown in Figure 9.

Figure 9. The tree species *Callicoma serratifolia* Andrews in album B70.1; the specimen arrangement shows the upper and lower sides of the leaves. Photo: Kevin Mills.

Duggins (pers. comm. 2023) recognises the arrangements as typical for pressed plant albums of the time and that the bouquet arrangements are in the style of the florilegia. While it is possible that anyone could create the specimen arrangements in Stewart's albums, without having seen similar ones, it is far more likely that the compiler was someone aware that others, including Mary Ann Armstrong, were already arranging pressed specimens into albums in similar ways. Bäuerlen is more likely to have created the specimen arrangements than Stewart, given that Bäuerlen had greater botanical knowledge and was part of the Australian botany community.

Numbers: size, pages and species

Of the historical newspaper pieces that we have found on Bäuerlen's fern albums, the above piece in *The Shoalhaven Telegraph* is the only one that indicates an album size, stating 'demi folio'. According to the *Authors' & Printers' Dictionary* (Collins 1912), a 'Demy folio' is, width first, 17.5 by 11.25 inches, which equates to 44.5 by 28.5 cm. The size is broadly in keeping with Stewart's fern album at 37 by 28 cm.

Numeric information in the newspaper pieces suggests variation between different albums in the number of pages of specimens and of represented species. Such variation between albums seems expected for homemade albums, especially when Bäuerlen may have purchased different kinds of 'blank' albums over the period when he produced them. Thus, differences in this kind of information between the Stewart fern album and any one newspaper report of a fern album by Bäuerlen doesn't preclude attribution of Stewart's fern album to Bäuerlen.

Stewart's fern album at 61 species (represented by 65 specimens) over 31 pages compares with these numbers mentioned in newspapers: '50 fern varieties' in *The Shoalhaven Telegraph*, 5 July 1883; '60 pages' in *The Shoalhaven Telegraph*, 16 August 1883; and 'more than eighty varieties' in *The Kiama Reporter and Illawarra Journal*, 26 Oct 1883.

Proximity to Stewart

By 1883 Bäuerlen was based in the Shoalhaven region (Wilson 1990). His collection records (Australasian Virtual Herbarium) and historical newspaper pieces about his lectures indicate his ongoing presence in the area, with collecting trips elsewhere, until 1886. Bäuerlen was giving his postal address as the post office at Cambewarra, a village only 12 km from Broughton Creek (Berry), by 8 July 1886. This is the date of the first letter by Joseph Maiden to Bäuerlen (Powerhouse Museum's Archive, MRS/203-3/87). Other letters indicate that Bäuerlen lived at Cambewarra at least until 31 August 1886, before moving to a property at Braidwood by 16 September. Bäuerlen's home base was geographically close to Stewart's on 26 August 1886, when Stewart inscribed the albums.

Furthermore, Stewart's inscription date of 26 August being so close to Bäuerlen's move to the Braidwood area between 31 August and 16 September, is a detail that arguably supports Bäuerlen being the compiler of the albums. For instance, this date proximity could fit the scenario of Bäuerlen promising the albums to Stewart and providing them to him shortly before he moved to Braidwood. Bäuerlen and Stewart were also socially as well as geographically proximal. They lived in a region of small towns with multiple social interconnections and, if not also via other possible shared interests and contacts, local agricultural societies would have presented multiple opportunities to meet.

John Stewart

Stewart migrated to Australia from Scotland in 1864 to join his father William Stewart and William's two siblings, who were already living at a property called *Mananga* at Broughton Creek,

then owned by Berry and Wollstonecraft's Coolangatta Estate. The brothers William and Donald worked for this estate. John Stewart established his own auction business, first registered in 1873. He sold land, buildings, furniture and animal stock and, judging by advertisements in local newspapers in 1886, was already regionally prominent by then, with one office in Broughton Creek. Later, around 1890, Stewart partnered with Mark Morton, who later became an MLA and was instrumental in founding Morton National Park, to establish Stewart and Morton Auctioneers. This business grew to a major regional scale with several offices, a head office in Nowra, and a scope that ended up including the sale and transport of cattle out of the region, including interstate.

By August 1886, Stewart was married with six children, living with his family at *Mananga*, and involved in local societies. This included as a founding committee member of the Broughton Creek Horticultural and Agricultural Society in 1883 and it's newly elected President in April 1886, a role he continued until 1888. Later, he undertook several other important roles in the district, including the Mayor of Broughton Creek in 1892. Stewart was clearly an important figure in the Berry area, and his ownership of the albums adds to their local historical significance.

Figure 10. John Stewart, photo by Samuel Cocks of Kiama, c.1920s. Berry & District Historical Society Inc.

Compilation by Stewart ruled out

John Stewart can be safely ruled out as the compiler of the albums. Firstly, an amateur botanist at that time would be highly unlikely to achieve the near-perfect species identification that is demonstrated by the handwritten scientific names, allowing for naming updates since. Secondly, we have found no evidence of Stewart having been involved in botany or plant collecting at any level.

John Stewart's grandson and his wife, now both deceased, donated the albums to the Berry & District Historical Society in 1979. The Museum's collection record for the albums does not indicate any communication to the Museum by the donors of John Stewart having had any role in the creation of the albums; the donors' daughter, Barbara Heriot, does not recall any family story of John Stewart having collected plants. John Stewart has no mentions in records of Australian botanical history, in a search of several obvious sources: as a plant collector in the Australasian Virtual Herbarium, in the records at the Library of the Royal Botanic Gardens, Melbourne, as a correspondent with Baron Ferdinand von Mueller, who engaged a vast group of amateur botanic collectors around Australia (P. Bertling, pers. comm., 2023); or in the list of known nineteenth century collectors compiled by George (2009).

Though there is no written documentation linking Stewart to Bäuerlen, Stewart would have had opportunities to meet Bäuerlen, not least through the Shoalhaven Agricultural and Horticultural Society, including at their annual show in February 1884, when Bäuerlen 'exhibited a set of specially bound volumes of the ferns of the Illawarra' (Martin 2013) or at his lecture about the *Bonito* expedition for the Society in Nowra in March 1886. Our research suggests that Stewart would have been involved in the activities of both the Broughton Creek and Shoalhaven societies, for reasons including that the Broughton Creek society was a 'splinter' from the Shoalhaven society, including with its initial financial support when it was agreed in 1883 that two societies could be supported in the area.

Botanical interest

No collection locations are provided for the specimens but the albums provide insight into species that were likely present in the Illawarra-Shoalhaven in the 1880s; almost all can still be found in that region. Several are notable for their rarity. *Lastreopsis hispida*, mentioned above, is listed as endangered in NSW and thought to be extinct on the NSW South Coast (Mills 2023). Of the nine *Lastreopsis hispida* collections in NSW herbaria, eight are from the Blue Mountains (Mt Wilson area), the other is a Bäuerlen specimen from Brogers Creek, Kangaroo Valley. The specimen in the fern album would be the second collection from the NSW South Coast, if it was obtained there. Another threatened species *Solanum celatum* A.R.Bean in the flowering plant album is endemic to the area between Wollongong, Goulburn, and Tomerong; see Figure 11. This species is quite common in Kangaroo Valley where Bäuerlen's specimen may well have been gathered.

The specimens and albums have botanical history significance in being compiled and almost certainly collected by Bäuerlen, an important 19th Century botanical collector. Nine NSW plant species are named in his honour, five by Ferdinand von Mueller. One of those, *Correa baeuerlenii* F.Muell., appears in the flowering plants album (Figure 12). The type specimen was gathered by Bäuerlen in 1884 "on stony banks of rivulets of the Upper Clyde" (von Mueller 1884). It has an interesting disjunct distribution, a population in the upper Clyde River valley–Budawang Range area, the type locality, and another some 60 km to the south, in the Biamanga–Mimosa Rocks area. A specimen identified as '*Lomaria Bauerlenii*' in the fern album, but now known as *Blechnum camfieldii* author, was named *Lomaria capensis* var. *bauerlenii* by Frederick Bailey in 1884, the type specimen 'found by Mr. W. Baeuerlen in the Illawarra districts of N.S.Wales' (Bailey 1884).

Figure 11. The shrub *Solanum celatum* A.R.Bean in album B70.1. The dense stellate hairs are typical of this species. Photo: Kevin Mills.

Figure 12. The shrubs *Correa baeuerlenii* F.Muell. (right) and *Correa lawrenceana* Hook. (left) in album B70.1; the latter is probably variety *macrocalyx*. Photo: Phil Bragg.

Possibility of other Bäuerlen albums

Despite searching for plant albums across a wide range of likely Australian collecting institutions, including historical societies on the NSW South Coast, no additional albums have been located. The Stewart albums may well be the only surviving copies of a series of albums produced by Bäuerlen in the 1880s, but as the historical newspaper pieces suggest he sold numerous fern albums, it is possible that others still exist in public or private ownership. Future discoveries in Australian collecting institutions are not precluded, even in the institutions already consulted; cataloguing can affect the level to which objects are discoverable in a collection and/or a copy could be newly acquired. Copies may also be held privately. In the light of this possibility, Johnston (2023) requested news of any similar albums through the project email address SeekingWB@gmail.com. We extend this call to readers of *Cunninghamia*.

If more albums could be located and studied, some of the remaining mysteries about Bäuerlen's pressed plant albums and his early years in Australia may be resolved. To help with the recognition of other albums, we highlight three points.

- First, albums compiled by Bäuerlen may not be marked with his signature or initials. The foremost clues suggesting as album by Bäuerlen are his characteristic handwriting, combined with similarity to the Stewart albums in the arrangement of specimens and other elements of format.
- Secondly, as Bäuerlen may have purchased different 'blank' albums, there may be variations in the exterior appearance, size and number of pages, as well as in the species included and the number of species represented.
- Thirdly, we have found no historical record of Bäuerlen selling albums of flowering plants, as opposed to ferns. This raises the question of whether Stewart's flowering plant album was a 'one-off' by Bäuerlen for Stewart at that time, perhaps related to that first-time election of Stewart as President of the Broughton Creek Horticultural and Agricultural Society in 1886.

Conclusion

A combination of evidence convincingly demonstrates that two albums of pressed plants once owned by John Stewart, and now held by the Berry & District Historical Society, were compiled by William Bäuerlen. John Stewart is ruled out as the compiler; he inscribed them to mark his ownership. The albums are of considerable historical and botanical significance; the absence of specific locations and dates for specimens is made up by the contextual evidence provided in this paper.

Acknowledgements

The authors thank the Berry & District Historical Society and the Powerhouse Museum, Sydney for facilitating in-person access to materials in their care, the Royal Botanic Gardens, Sydney for initial (digital) samples of Bäuerlen's handwriting, and Phil Bragg for some photographs. We also thank Barbara Heriot, Stewart's great-granddaughter, for her insight. Finally, we thank Tamara Hynd, Curator at the Shellharbour City Museum for introducing us as authors and providing some research details.

References

Armstrong M. A. (Mrs C. C.) (c.1889) *The South Pacific Fern Album*. J. Twomey, Melbourne.

The Australasian Virtual Herbarium (2024) Council of Heads of Australasian Herbaria, accessed through the ALA website (URL). Search on Bäuerlen and Bauerlen as collector over August–November 2023. For more information, see URL

Bailey, F. M. (1884) *The fern world of Australia, supplement*: 4.

Bonyhady, T. (2000) Fern Fever pp. 102–125, in *The Colonial Earth,* Miegunyah Press.

Bäuerlen W. & Lovegrove, G. (1891) *The Wild Flowers of New South Wales*. Angus & Robertson, Sydney, 12 pp. URL

Bauerlen, W. (1886) *The Voyage of the Bonito: an account of the Fly River Expedition to New Guinea*. Gibbs, Shallard & Co., Printers and Publishers, Sydney. By request of the Agricultural Society of Shoalhaven, 38 pp. URL

Collins, F. H. (1912) *Authors' & Printers' Dictionary, a guide for authors, editors, printers, correctors of the press, compositors, and typists, with full list of abbreviations: an attempt to codify the best typographical practices of the present day*. Henry Frowde, London etc., *4th Edition*, 263 pp. URL

Council of Heads of Australasian Herbaria (2024) The Australasian Virtual Herbarium (URL), accessed August–November 2023.

Duggins, M. (2016) The World's Fernery: New Zealand, fern albums, and nineteenth-century fern fever, pp. 102–123 in *New Zealand's Empire*, Pickles, K. and Coleborne, C. (eds), Manchester University Press.

Garran, A. (ed.) (1886) *The Picturesque Atlas of Australasia, Volume 1.* Picturesque Atlas Publishing Company Ltd. Sydney, etc., 254 pp. URL

George, A. S. (2009) *Australian Botanist's Companion*, Four Gables Press, Kardinya WA.

Hamburg Passenger Lists, 1850–1934. Leonhard Bäuerlen, Vol. 373-7 I, VIII A1, Band 017.

Horne, J. (2005) How Ferns Became Beautiful, pp. 253–280 in *The Pursuit of Wonder: how Australia's landscape was explored, nature discovered and tourism unleashed*. Miegunyah Press, Carlton.

Johnston, J. (2023) Join the Hunt for Bäuerlen's long lost legendary ferns, *Australian Geographic*, online article. URL

Martin, M. (2013) The Cambewarra connection: William Bäuerlen, Gertrude Lovegrove and the Wild Flowers of New South Wales, *Australiana* 35: 4–9.

Mills, K. (2023) *South Coast Ferns. A complete guide to the ferns and fern allies of the NSW South Coast*. Envirobook, Sussex Inlet, 191 pp.

Mueller, F. J. H. von (1884) Record of an undescribed *Correa* of New South Wales. *Proceedings of the Linnean Society of NSW* 9: 960.

NSW Government (1886) *The Railway Guide of New South Wales, Third Edition, For the use of tourists, excursionists and others, A convenient reference to railway routes, stations and places of interest on the lines of railway: containing various maps and numerous illustrations*. Charles Potter, Government Printer, Sydney, 148 pp. plus maps. URL

The Kiama Reporter and Illawarra Journal (NSW: 1899–1947), Happenings (1943, May 19). p. 6. URL

The Shoalhaven Telegraph (NSW: 1881–1937), LOCAL INTELLIGENCE. (1883, July 5). p. 2, URL

The Shoalhaven Telegraph (NSW: 1881–1937), LOCAL INTELLIGENCE. (1883, August 16). p. 2. URL

The Sydney Mail and New South Wales Advertiser (NSW: 1871–1912), Shoalhaven. (1883, August 11), p. 263. URL

Whittingham, S. (2012) *Fern Fever: The Story of Pteridomania*. Frances Lincoln.

Wilson, K. L. (1990) William Baeuerlen – a "circumspect and zealous" collector, pp. 97–103 in *History of systematic botany in Australasia*, P. S. Short (ed.) Australian Systematic Botany Society Inc., South Yarra.

Wurttemberg, Germany, Family Tables, 1550–1985, Leonhardt Wilhelm Carl Baeuerlen, FHL Film Number 1340109. Accessed online via Ancestry.com.

Appendix 1
List of plants contained in the two albums (B70.1, B70.2) held at the Berry Museum.
Album 1 totals - 34 pages, 90 specimens, 90 species.
Album 2 totals – 31 pages, 65 specimens, 61 species.

Current names are those used by Australian Plant Census.

Page No./Specimen No.	*Current Name*	*Notes*	*Habit*
FLOWERING PLANTS ALBUM 1 (B70.1)			
John Stewart, Broughton Creek, 26th Aug. 1886.			
Page 1			
1. *Sturmia reflexa*	*Cestichis reflexa*, syn. *Liparis reflexa*	moss; flowers	orchid
2. *Tetratheca thymifolia*	*Tetratheca thymifolia*	flowers	shrub
3. *Acacia hakeoides*	*Acacia myrtifolia*	flowers; incorrect original ID	shrub
4. *Viola hederacea*	*Viola hederacea*	flowers	herb
Page 2			
1. *Ranunculus lappaceus*	*Ranunculus lappaceus*	moss; flowers	herb
2. *Brachycome scapiformis*	*Brachyscome spathulata*	flowers	herb
3. *Viola betonicifolia*	*Viola betonicifolia*	flowers	herb
Page 3			
1. *Kennedya rubicunda*	*Kennedia rubicunda*	flowers	creeper
2. *Billardiera scandens*	*Billardiera mutabilis*	flowers; also on frontispiece	creeper
Page 4			
1. *Indigofera australis*	*Indigofera australis*	flowers	shrub
2. *Correa alba*	*Correa alba*	flowers	shrub
Page 5			
1. *Actinothus helianthi*	*Actinotus helianthi*		herb
2. *Callistemon linearis*	*Callistemon linearis*		shrub
3. *Sarchochilus Hillii*	*Sarcochilus falcatus*	flowers; leaves not *S. hillii*	orchid
Page 6			
1. *Isotoma axillaris*	*Isotoma axillaris*	flowers	herb
2. *Diuris maculata*	*Diuris maculata*	flowers	orchid
3. *Sowerbya juncea*	*Sowerbaea juncea*	flowers lost	herb
Page 7			
1. *Helichrysum semipapposum*	*Chrysocephalum semipapposum*	moss; flowers	herb
2. *Boronia Barkeriana*	*Boronia barkeriana*	flowers	herb
3. *Goodenia stelligera*	*Goodenia stelligera*	flowers	herb
4. *Boronia parviflora*	*Boronia parviflora*	specimen lost	herb
Page 8			
1. *Scaevola aemula*	*Scaevola aemula*	flowers	herb
2. *Helichrysum rosmariniformis*	*Ozothamnus rosmarinifolius*	flowers	shrub
Page 9			
1. *Helypterum incana*	*Leucochrysum alpinum*	flowers; alpine	herb
2. *Humea elegans*	*Calomeria amaranthoides*	flowers	herb
-	*Caustis flexuosa*	no name provided in album	sedge
Page 10			
I. *Gompholobium grandiflorum*	*Gompholobium grandiflorum*	flowers	shrub
2. *Didiscus pilosa*	*Trachymene composita* var. *composita*	flowers	herb
3. *Pultenaea daphnoides*	*Pultenaea daphnoides*	flowers	shrub
Page 11			
1. *Scavola hispida*	*Scaevola ramosissima*	flowers	herb
2. *Helichrysum lucidum*	*Xerochrysum bracteatum*	flowers	herb
Page 12			
1. *Mirbelia grandiflora*	*Mirbelia platylobioides*	flowers	shrub
2. *Howittia trilocularis*	*Howittia trilocularis*	flowers	shrub

Page No./Specimen No.	Current Name	Notes	Habit
Page 13			
1. *Grevillea Miqueliana*	*Grevillea miqueliana*	flowers; Victoria	shrub
2. *Rubus mollucanus*	*Rubus moluccanus* var. *trilobus*	flowers	vine
Page 14			
1. *Boronia ledifolia*	*Boronia ledifolia*	flowers	shrub
2. *Lythrum hyssopifolium*	*Lythrum salicaria*	flowers; incorrect original ID	herb
3. *Goodia latifolia*	*Goodia latifolia*	flowers	shrub
Page 15			
1. *Gompholobium latifolium*	*Gompholobium latifolium*	flowers	shrub
2. *Pultenea stricta*	*Pultenaea stricta*	flowers; Victoria/SA	shrub
3. *Bauera rubioides*	*Bauera rubioides*	flowers	shrub
4. *Pimelia colorrans*	*Pimelea stricta*	flowers	shrub
Page 16			
1. *Pelargonium australe*	*Pelargonium australe*	flowers	herb
Page 17			
1. *Comesperma sphaerocarpa*	*Comesperma sphaerocarpum*	flowers	herb
2. *Boronia pinnata*	*Boronia pinnata*	flowers	shrub
Page 18			
1. *Alternanthera driandra*	*Alternanthera denticulata*	flowers	herb
2. *Commelina cyanea*	*Commelina cyanea*	flowers	herb
Page 19			
1. *Leptorhynchus nitidus*	*Leptorhynchos nitidulus*	flowers	herb
2. *Dampiera stricta*	*Dampiera stricta*	flowers	herb
3. *Cassinia quinquefaria*	*Cassinia quinquefaria*	flowers	shrub
4. *Dracophyllum secondum*	*Dracophyllum secundum*	flowers	herb
Page 20			
1. *Eriostemon phylicioides*	*Leionema diosmeum*	flowers	shrub
2. *Dodonaea viscosa*	*Dodonaea viscosa*	flowers	shrub
3. *Solanum aviculare*	*Solanum celatum*	flowers; incorrect original ID	shrub
Page 21			
1. *Acacia longifolia*	*Acacia longifolia* ssp. *longifolia*	flowers	shrub
2. *Bossiaea heterophylla*	*Bossiaea heterophylla*	flowers	shrub
Page 22			
1. *Kennedya prostrata*	*Kennedia prostrata*	flowers	creeper
Page 23			
1. *Callicoma serratifolia*	*Callicoma serratifolia*	flowers	tree
Page 24			
1. *Correa Lawrenciana*	*Correa lawrenceana*	flowers	shrub
2. *Correa Bauerlenii*	*Correa baeuerlenii*	flowers	shrub
Page 25			
1. *Oxylobium trilobatum*	*Podolobium ilicifolium*	flowers	shrub
Page 26			
1. *Hibbertia volubilis*	*Hibbertia dentata*	flowers; incorrect original ID	creeper
2. Cassia australis	*Senna barronfieldii*	flowers	shrub
Page 27			
1. *Stypandra longifolia*	*Stypandra glauca*	flowers	herb
2. *Tecoma jasminoides*	*Pandorea pandorana*	flowers	vine
Page 28			
1. *Eriostemon lepidotus*	*Phebalium squamulosum*	flowers	shrub
2. *Pimelia linifolia*	*Pimelea linifolia*	flowers	shrub
3. *Trifolium arvense*	*Trifolium arvense*	flowers, roots; introduced	herb

Page No./Specimen No.	*Current Name*	*Notes*	*Habit*
Page 29			
1. *Eriostemon saligna*	*Crowea saligna*	flowers	shrub
2. *Baeckea crenulata*	*Baeckea brevifolia*	flowers; incorrect original ID	shrub
3. *Platylobium formosum*	*Platylobium formosum*	flowers	shrub
Page 30			
1. *Oxylobium cordifolium*	*Oxylobium cordifolium*	flowers	shrub
2. *Pultenea pycnocephala*	*Pultenaea pycnocephala*	flowers; North Coast of NSW	shrub
3. *Epacris impressa*	*Epacris impressa*	flowers	shrub
Page 31			
1. *Kennedya monophylla*	*Hardenbergia violacea*	flowers	creeper
2. *Styphelia amplexicaulis*	*Leucopogon amplexicaulis*	flowers	shrub
3. *Goodenia ovata*	*Goodenia ovata*	flowers	shrub
Page 32			
1. *Linum marginale*	*Linum marginale*	flowers	shrub
2. *Sprengelia incarnata*	*Sprengelia incarnata*	flowers	shrub
3. *Erythraea australis*	*Schenkia australis*	flowers	herb
4. *Anthemis cotula*	*Anthemis cotula*	flowers; introduced	herb
Page 33			
1. *Acianthus fornicates* (1)	*Acianthus fornicatus*	flowers; numbers mixed up	orchid
2. *Pterostylis parviflora* (4)	*Pterostylis parviflora*	flowers	orchid
3. *Glossodia major* (3)	*Glossodia major*	flowers	orchid
4. *Pterostylis acuminata* (2)	*Pterostylis acuminata*	flowers	orchid
5. *Caladenia suavuolens* (6)	*Lyperanthus suaveolens*	flowers	orchid
Page 34			
1. *Pultenea ternata*	*Pultenaea spinosa*	flowers	shrub
2. *Helypterum dealbatum*	*Argentipallium dealbatum*	flowers; Victoria/Tas.	herb
3. *Pultenea retusa*	*Pultenaea retusa*	flowers	shrub
4. *Chloanthes stochaedis*	*Chloanthes stoechadis*	flowers	herb
FERN ALBUM 2 (B70.2)			
John Stewart, Broughton Creek, 26th Aug. 1886			
Page 1			
1. *Botrychium ternatum*	*Botrychium australe*	lichen; fertile frond	fern
2. *Pteris paradoxa*	*Pellaea calidirupium*	fertile frond	fern
3. *Polypodium australe*	*Notogrammitis billardierei*	fertile frond	fern
4. *Hymenophyllum javanicum*	*Hymenophyllum australe*		fern
Page 2			
1. *Notholaena distans*	*Cheilanthes austrotenuifolia*	moss, lichen; fertile frond	fern
2. *Gramanitis rutaefolia*	*Asplenium subglandulosum*	tablelands	fern
Page 3			
1. *Adiantum plumosum*	*Adiantum aethiopicum*	moss, lichen; fertile frond	fern
2. *Polypodium scandens*	*Dendroconche scandens*	fertile frond	fern
3. *Trichomanes apiifolium*	*Abrodictyum cordatum*	fertile frond	fern
Page 4			
1. *Asplenium umbros*um	*Diplazium australe*		fern
Page 5			
1. *Aspidium aculeatum*	*Polystichum australiense*	moss (2), lichen; fertile frond	fern
2. *Doodia blechnoides*	*Blechnum rupestre*	fertile frond	fern
Page 6			
1. *Asplenum falcatum*	*Asplenium polyodon*	moss, lichen; fertile frond	fern
2. *Lomaria capense*	*Blechnum wattsii*	fertile frond	fern

Page No./Specimen No.	Current Name	Notes	Habit
Page 7			
1. *Davallia pixidata*	*Davallia solida* var. *pyxidata*	lichen; fertile frond	fern
2. *Hymenophyllum tunbridgense*	*Hymenophyllum cupressiforme*		fern
Page 8			
1. *Asplenium bulbiferum*	*Asplenium gracillimum*	moss (2), lichen; fertile frond	fern
Page 9			
1. *Adiantum hispidulum*	*Adiantum hispidulum*	moss, lichen; fertile frond	fern
2. *Lomaria Patersonii*	*Blechnum patersonii*		fern
Page 10			
1. *Asplenium marinum*	*Asplenium obtusatum* ssp. *northlandicum* moss, lichen; fertile frond		fern
2. *Asplenium marinum* var. *dimorphum*	*Asplenium difforme*		fern
3. *Adiantum diaphanum*	*Adiantum diaphanum*	fertile frond	fern
Page 11			
1. *Todea barbara*	*Todea barbara*	lichen; fertile frond	fern
Page 12			
1. *Doodia caudata*	*Blechnum rupestre*	lichen; fertile frond	fern
2. *Todea Fraseri*	*Leptopteris fraseri*	locally rare	fern
3. *Trichomanes venosum*	*Polyphlebium venosum*	fertile frond	fern
Page 13			
1. *Aspidium acuminatum*	*Lastreopsis acuminata*	moss (2), lichen; fertile frond	fern
Page 14			
1. *Asplenium flaccidum*	*Asplenium flaccidum*	lichen; fertile frond	fern
2. *Asplenium flabellatum*	*Asplenium flabellifolium*	fertile frond	fern
Page 15			
1. *Gleichenia Hermanii*	*Dicranopteris linearis*	lichen; locally extinct	fern
2. *Gleichenia dicarpa*	*Gleichenia dicarpa*		fern
Page 16			
1. *Aspidium molle*	*Christella dentata*	lichen; fertile frond	fern
2. *Notholaena vellea*	*Cheilanthes distans*		fern
Page 17			
1. *Lomaria discolor*	*Blechnum nudum*	lichen; fertile frond	fern
2. *Lindsaya linearis*	*Lindsaea linearis*	fertile frond	fern
3. *Lindsaya trichomanoides*	*Lindsaea trichomanoides*	fertile frond; rare	fern
Page 18			
1. *Lindsaya microphylla*	*Lindsaea microphylla*	lichen; fertile frond	fern
2. *Asplenium Trichomanes*	*Asplenium trichomanes*	fertile frond; limestone	fern
Page 19			
1. *Asplenium nidus*	*Asplenium australasicum*	moss; fertile frond	fern
2. *Lomaria alpina*	*Blechnum penna-marina* ssp. *alpina*	fertile frond; alpine	fern
3. *Aspidium capense*	*Rumohra adiantiformis*	fertile frond	fern
Page 20			
1. *Aspidium hispidum*	*Lastreopsis hispida*	fertile frond	fern
Page 21			
1. *Lomaria Bauerlenii*	*Blechnum camfieldii*	lichen	fern
2. *Hymenophyllum bivalve*	*Hymenophyllum bivalve*		fern
Page 22			
1. *Asplenium javanicum*	*Deparia petersenii* ssp. *congrua*	moss, lichen; fertile frond	fern
2. *Blechnum cartilagineum*	*Blechnum cartilagineum*	fertile frond	fern
Page 23			
1. *Pteris tremula*	*Pteris tremula*	moss, lichen; fertile frond	fern
2. *Schizaea rupestris*	*Schizaea rupestris*	fertile frond	fern

Page No./Specimen No.	*Current Name*	*Notes*	*Habit*
Page 24			
1. *Lomaria fluviatilis*	*Blechnum camfieldii*	moss, lichen; fertile frond; Incorrect original ID	fern
2. *Schizaea dichotoma*	*Schizaea dichotoma*	fertile frond	fern
Page 25			
1. *Pteris vespertilionis*	*Histiopteris incisa*	fertile frond	fern
2. *Pteris umbrosum*	*Pteris umbrosa*		fern
Page 26			
1. *Aspidium ramosum*	*Arthropteris tenella*	fertile frond	fern
2. *Polypodium serpens*	*Pyrrosia rupestris*	fertile frond	fern
-	*Arthropteris beckleri*	not named	fern
Page 27			
1. *Pteris aquiline*	*Pteridium esculentum*	fertile frond	fern
2. *Lomaria pinnata*	*Blechnum nudum* cristate form		fern
3. *Aspidium unitum*	*Arthropteris beckleri*	fertile frond	fern
Page 28			
1. *Polypodium punctatum*	*Hypolepis glandulifera*	moss, lichen; fertile frond	fern
Page 29			
1. *Hymenophyllum flabellatum*	*Hymenophyllum flabellatum*	fertile frond	fern
Page 30			
1. *Platycerium alciocornis*	*Platycerium bifurcatum*	*Platycerium* piece; fertile	fern
2. *Pteris falcata*	*Pellaea nana*	fertile frond	fern
3. *Dicksonia antarctica*	*Dicksonia antarctica*		fern
Page 31			
1. *Polyhpodium pustulatum*	*Zealandia pustulata*	lichen; fertile frond	fern
2. *Trichomanes digitatum*	*Hymenophyllum lyallii*	fertile frond	fern